Chemical Engineering Catalog

1921

(SIXTH ANNUAL)
EDITION

Collected, Condensed and Standardized Catalog Data of Equipment, Machinery, Laboratory Supplies, Heavy and Fine Chemicals and Raw Materials used in the Industries Employing Chemical Processes of Manufacture

with

A General Directory of Such Equipment and Materials, Classified and Cross-Indexed

and

A Technical and Scientific Books Section, Cataloging and Briefly Describing a Practically Complete List of Books in English on Chemical and Related Subjects

Published by

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DISTRIBUTION

of the

Chemical Engineering Catalog

The Catalog is *leased at $2.00 a copy*, for the period of one year, to those included in the following-named classifications, with the understanding that upon publication of the succeeding volume this copy is subject to recall.

1. Chemical Engineers, Works Managers, Superintendents, etc.
2. Consulting, Designing and Constructing Engineers in Chemical lines.
3. Chief Chemists of Industrial and Research Laboratories.
4. Heads of Chemical Departments in Universities, Colleges, and Technical Schools.
5. Technical Departments of the United States and Foreign Governments, and Libraries.
6. Foreign Chemists and Engineers.

To those not included in the above classes a charge of $10.00 a copy is made for the volume. Eleven thousand five hundred copies of this edition have been printed for distribution.

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CO-OPERATION on the part of all included in the regular distribution, by mentioning the Catalog when communicating with the firms whose products are described or listed therein, is of the greatest assistance to the publishers in their efforts to make each successive edition a larger and better reference work for the chemical field.

The firms who use space in the Catalog are naturally interested in securing direct and visible evidence that their investment is a profitable one. By consistent mention of the Catalog in communications addressed to them they will be assured on this ground; and, moreover, will be encouraged to supply more detailed data in succeeding volumes, thus increasing the reference value of the work to all its users.

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The CHEMICAL CATALOG COMPANY, *Inc.*

Press of J. J. Little & Ives Co., New York

The Chemical Engineering Catalog Defined

Described in general terms, the Chemical Engineering Catalog is the official, standard work of reference for Chemical Engineers, Works Managers, Purchasing Agents, Operating Engineers, and others who buy and specify equipment and materials in the various industries using chemical processes of manufacture.

Stated more specifically, it is a compilation of condensed catalog data of manufacturers supplying this field, standardized as to page size and typographical arrangement, supplemented by a General Classified Directory of equipment, supplies and materials, and bound into one volume for convenient reference throughout the year. It is a room-full of individual catalogs, abstracted, indexed and assembled within the covers of a single book.

The volume is published annually under the supervision of an official Committee, appointed by the American Institute of Chemical Engineers, the American Chemical Society and the Society of Chemical Industry. The members of this Committee, whose names appear elsewhere in the introductory pages of this volume, have no financial interest whatsoever in the publication of the Catalog, but are giving their time and attention to the supervision of the work from a realization of its great practical usefulness, and a public-spirited desire to see it well and thoroughly performed.

The field of the Chemical Industries is a broad and vital one, embracing as it does such lines of manufacture as Sugar Making and Refining, Fertilizer, Cement, Paints and Varnishes, Prepared Foods, Leather, Textile Bleaching and Dyeing, Paper and Pulp, Rubber, Metals, Oils, Soap, Extracts, Glass and many others, in addition to the enormous output of Chemicals and Acids themselves. All such lines are necessarily under the manufacturing direction or supervision of men of chemical training or experience, whose work in actually turning out the finished product is constantly reinforced and advanced by the great experimental and research army working in the technical schools and the industrial plant laboratories.

The main purpose of the Chemical Engineering Catalog is to *inform* this vast market, rather than to advertise to it in the usual way. By authority of the Supervising Committee, which directly represents the wishes of those who use the volume for buying purposes, the Publishers are required to exclude all general claims, exaggerated statements, and display material, and to use every effort to develop and encourage the publication in the catalog pages of precise data, such as specifications, construction details, tables of sizes and capacities, and specific uses or adaptations of equipment and materials.

It should be borne in mind that in all these industries where chemical processes are employed, the chemical engineers or others in charge of production must be responsible not only for the operation of the specifically chemical equipment, but also for the power plant and all the other departments of the factory, because these must be intimately connected in operation with whatever chemical apparatus may be used. Therefore, it is apparent that the Chemical Industries afford a most important and direct market for the manufacturers of Power Plant Equipment, Hoisting, Conveying and Elevating Machinery, Power Transmission Equipment, Testing, Measuring and Recording Apparatus, Construction Materials—in fact, every item that enters into the construction and operation of any class of industrial plant.

An important feature of the service rendered to firms represented in the Chemical Engineering Catalog is the furnishing each year of a printed Distribution List to every space user, showing the names and addresses of the firms and individuals to whom the Catalog is distributed. This Distribution List, carefully revised and brought up to date annually, is not for sale under any conditions, but is furnished without additional charge for the exclusive use and benefit of the firms who carry space in the Catalog. The distribution of this edition of the Catalog is 11,500 copies guaranteed.

It will be seen that the service offered through the Chemical Engineering Catalog is an extremely valuable one for the manufacturer of any of the wide range of products used and applied in this field. It is in no respect competitive with the functions of display advertising in journals or trade papers, but stands alone as a direct, permanent and economical information system, completely covering the entire worth-while buying power of the Chemical Industries.

Acknowledgment

To the following-named Committee, appointed by The American Institute of Chemical Engineers, the American Chemical Society and the Society of Chemical Industry to supervise the compilation and formulate the specifications and standards of the Chemical Engineering Catalog, we take pleasure in expressing our renewed acknowledgments and thanks for the invaluable counsel and assistance which they have so freely given in furtherance of our work:

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A communication from the Committee concerning this, the 1921 (Sixth Annual) Edition of the Chemical Engineering Catalog, appears on the following page.

An expression of our further appreciation is also due for the helpful cooperation and many valuable suggestions received from individual members of the three Societies.

The Chemical Catalog Company, *Inc.*

A Statement from the Committee on The Chemical Engineering Catalog

The present issue of the Chemical Catalog marks the sixth year of the enterprise. It has many improvements in itself, and moreover it measures the advance which the whole proposition is making in its chosen field of informative chemical technology.

The present volume does not show the growth recorded in previous years, but, considering the state of business affairs, the Committee is of the opinion that the number of firms represented and volume of material included are highly satisfactory.

The statistical report made by the Company is as follows:

	1916	*1917*	*1918*	*1919*	*1920*	*1921*
Number of firms using space	132	247	439	604	748	667
Average number of pages per firm	1.5	1.40	1.33	1.40	1.44	1.54
Maximum number of papers to one firm	8	18	20	22	22	95
Catalog pages	205	347	578	850	1048	971
Number of copies printed	8500	8500	10200	11200	11500	11500

It is gratifying to note, in examining these statistics, that there is an increasing tendency on the part of space-users to use more space than formerly. The percentage of increase, although slight, shows progress in line with an important underlying purpose of the Catalog, viz: To have space-users use enough space to properly catalog their products.

There is general improvement in the makeup of the volume. In order to lessen the weight of the book, which was becoming unwieldy as it grew, the publishers have produced it in new format with flexible leather-cloth covers and a thin paper which is a good paper on which to print illustrations. The volume thus becomes several pounds lighter

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Requirements for the Preparation of Copy and Digest of Typographical Specifications Adopted for the Chemical Engineering Catalog

PURPOSE AND USE

The Chemical Engineering Catalog is a standardized reference work, not a display advertising medium, and therefore requires a special style of copy if the best results are to be secured.

The users of the book, Chemical Engineers, Factory Managers, Chemists, Operating Executives and Purchasing Agents, refer to its pages for detailed information; therefore display advertisements are unnecessary, inadequate and out of place. The Classified Directory of Equipment and Materials directs the intending buyer to your pages. *Definite facts should be presented, including careful descriptions of the equipment or materials cataloged, tables of sizes, capacities, properties, etc.*; illustrations where required, and suggestions regarding uses, in various industries and under varying conditions. Generalities and "selling talk" are not in keeping with the purpose of the work and are therefore not acceptable.

TYPOGRAPHICAL SPECIFICATIONS

These typographical specifications have been approved by the Committee supervising the publication of the Catalog on behalf of

The American Institute of Chemical Engineers,
The American Chemical Society,
The Society of Chemical Industry,

to secure that uniformity which is so essential to and fundamental in a technical and business reference system, as distinguished from a directory or display advertising medium.

It is hoped that all space users will realize that these standards have been created, not to impose arbitrary restrictions upon the presentation of matter, but rather to create additional values for all users of the book—both those who want to buy from its pages and those who offer equipment, materials or services to the Chemical Industries of America by means of The Chemical Engineering Catalog.

Dimensions—The size of the type page is 7 x 10 inches, which includes the running head at the top, added by the publishers. The exact space available for copy is 7 x 9¾ inches. There are two columns to the page, each 3¼ inches (20 picas) wide.

Order of Arrangement—A headline consisting of the firm name appears at the top of the first page of each representation. One line stating very briefly the nature of the business may, at the option of the space user, appear immediately beneath the firm name. The main address follows on one or more lines, together with the addresses of branch offices and plants, agents, foreign connections and cable address, if any. This heading is followed by the body of the Catalog.

Products Paragraph—A "Products" paragraph, or its equivalent—"Services," must be included and appear at the top of the first column in each individual catalog. This paragraph to mention by name, without extended description, the products, equipment, materials, or services offered.

Style and Size of Type—The standard type for the name of the company is 18-point Century Bold caps; for the description line, if used, 14-point Caslon, upper and lower case. The main address is set in 12-point and addresses of branches and plants in 6-point, upper and lower case.

The body of the catalog is set in 10-point Old Style, each subject being indicated by a brief title set in 10-point Old Style Antique caps, subdivisions in 10-point upper and lower case bold-face type. Specification forms, testimonials and other quoted matter are set in 8-point; tables, price lists, and titles to illustrations in 6-point. In no case is type larger than 18-point or smaller than 6-point employed. No deviation from styles or sizes of type mentioned is permissible.

ILLUSTRATIONS

Illustrations should be used whenever possible to convey information of value to the user of the book, but not otherwise. Cuts, special lettering, etc., designed for display or for ornament, and which do not illustrate the text, are inadmissible.

Cuts—In cases where it is desired to show the construction or engineering details of an article, line engravings are usually clearer and more effective than half-tones, and the use of the former is recommended for such purposes. Half-tones should not be finer than 133-screen to secure the best printing result. Deeply etched original cuts should be furnished. If electrotypes are used they should be new and in perfect condition. Cuts made by the publishers are charged for at best prevailing prices.

Trade-Marks—Reproductions of a firm's own trade or brand mark may appear in the heading or elsewhere on the page, such cuts to occupy space not in excess of one and one-half square inches. (A round trade-mark may be one inch in diameter.) The same trade or brand mark not to be used more than once in the same firm's space.

Titles (Captions)—A title must appear under every illustration. Such titles should briefly describe the illustration in the clearest and most concise language.

CLASSIFICATION

The 1921 Edition of The Chemical Engineering Catalog includes four sections: (1) The Classified Directory of Equipment and Materials, compiled by the publishers. (2) The Equipment Section. (3) The Chemicals and Materials Section. (4) The Technical Books Section. Catalogs are placed in their proper section and in alphabetical order by the publishers. This arrangement has given absolute satisfaction to users of the volume and is impartial to all firms. The only departure from strict alphabetical sequence is in those rare cases where a succession of two or four page catalogs necessitates a slight shifting from the exact alphabetical order of a catalog containing an odd number of pages.

INDEXING

For the sake of accuracy and as a guide to us in compiling the Classified Cross Index and Products Directory, all copy should be accompanied by a list of products which should properly be included in this section of the volume, these items being subject to editorial revision.

Information Bureau Service

Beginning January 1st, 1921, our Information Bureau Service was placed on an annual charge basis, the subscription fee being twenty-five dollars for any firm or individual using the service.

The service furnished by the Bureau is roughly defined as follows:

1. Information as to names and addresses of manufacturers and sources of supply of chemical machinery, scientific apparatus, chemicals, raw materials and supplies, power plant equipment—in fact, everything that enters into the erection and maintenance of any kind of industrial plant or laboratory where chemical processes are employed. When required the Information Bureau will suggest the most suitable firms to approach concerning complete lists of equipment required for new plants or additions
2. Market information as to the USES of various chemicals and materials; prices, past and present; whether or not these substances are imported or made in this country, and in what quantities or proportion
3. Statistics of production, exports, imports, etc., of chemicals, raw materials, ores, oils, etc.
4. Miscellaneous information concerning the location, personnel, products, etc., of any branch of the industrial chemical field.

In addition to the services outlined above, the Bureau is in a position to render special services and supply reports of a special nature, at rates to be agreed upon in advance.

What the Information Bureau Does NOT Do

It is important to keep in mind the kind of information the Bureau will *not* furnish. It will not perform any consulting chemical or engineering services. It will not render advice or make suggestions as to the comparative merits of various makes of equipment. It will not give information as to financial or personal responsibility concerning any firm or individual. It does not secure positions for chemists, nor employees for firms. Those in need of this latter service should apply to the Bureau of Employment of The Chemists' Club, 52 East 41st Street, New York City.

Five Years of Unusual and Satisfactory Service

For more than five years the Information Bureau has been furnishing industrial firms and professional men with the most unusual service, entirely without charge. The demands on it have been constantly increasing at such a rate that the Bureau has been obliged to expand to the point where we feel that the cost of its maintenance should be partially borne by those it is serving.

The Bureau is in charge of an experienced chemist, with assistants who are chemical engineers and chemists, and the work is conducted under the general supervision of the Technical Editor of the Chemical Engineering Catalog, who has at his service for consultation other chemists and engineers on the Catalog's technical staff.

During the five years of its existence the Bureau has accumulated valuable files and data to meet its peculiar requirements and has access to numerous public and private technical libraries in New York and elsewhere.

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The Chemical Catalog Company, *Inc.*
One Madison Avenue, New York, U. S. A.

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Classified Directory of Equipment and Materials

This Catalog is primarily a source of information as to MANUFACTURERS. In a few cases, however, it has seemed advisable to include others who are not first hands. By instructions of your Committee, the mark * is used to indicate that while a firm is a source of supply for the commodity in question, it is, so far as our records show, neither a manufacturer nor an exclusive agent for a manufacturer.

Firms using *catalog space* in our Chemicals and Materials Section do not in any instance carry this mark, for the reason that information regarding the ability of such firms to supply the commodity in question is furnished more specifically to the buyer in their own announcements. Such firms appear in this directory in **heavy faced letters, followed by** the number of the page whereon their facilities and products are stated.

In our *Catalog* pages we aim to carry the announcements only of firms which are actually manufacturers, or the exclusive or territorial sales agents of manufacturers.

All products are indexed under the main noun. For example, for "Steam Jacketed Kettles" see "Kettles, Steam Jacketed."

Chemical salts and other compounds are listed under the *base,* not the *acid.* For instance: "Sodium bichromate" not "Bichromate of Sodium." In all cases it has been the rule to adhere to recognized modern chemical nomenclature, but in cases where an unsystematic or old name is of technical importance, or is better known than the scientific name, a cross-reference is given. For instance, under "Sugar of Lead" will be found a cross-reference to "Lead Acetate."

In indexing organic compounds the prefixes "alpha," "beta," "meta," "ortho," and "para," are placed *after* the name of the substance to which they apply: e.g. look for "Aminophenol, Para," not "Para-Aminophenol." Numerical prefixes, such as "Di," "Tri" and "Tetra," are treated as part of the name. The prefix "Mono," is not used e.g. look for Chlorobenzol, not Monochlorobenzol.

Well-known trade names will be found in the index.

All numbers after names refer to the pages of the Catalog where detailed data as to products, facilities for delivery, etc, will be found stated. Where no page numbers are given, firms have not taken space to supply this fuller information, but have merely been listed to give the inquirer a more complete reference work. Depending solely on information furnished us by the firms themselves, the name of an important manufacturer of a given commodity may occasionally have been omitted. We believe, however, that these omissions are few in number and will be more than made up for by the greater accuracy of data possible only through this policy.

There are three particular points on which we would appreciate the suggestions of our readers:—

(1) Headings not at present found in this index which should be there.

(2) Additional important firms who should be found under headings under which some firms are already listed.

(3) Firms listed under wrong headings, and other inaccuracies which may have crept into this index in spite of all precautions.

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- Brit -Amer Chem Co, New York
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- **Gaskill Chemical Corpn.,** Brooklyn, N Y 1123

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- Innis, Speiden & Co, New York
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- Melville-Corbett Co., St. Marys, Pa.
- Merck & Co, New York
- Merrimac Chem. Co, Boston
- Michigan Iron & Chem. Co, Chicago
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Hodgson Bros Chem. Co, Lindsay, Ont
Industrial Dist Co, Waterloo, N Y
James Mfg Co, Kane, Pa
Kerry, Thos, Co, Hancock, N Y
Kentucky Wood Prod Co, Kragon, Ky
Kinzu Valley Chem Co, Williamsport, Pa
Lacka Chem Co, Olean, N Y
Lamont Chem Co, Kane, Pa
Leighton, Arthur, Co, Cook's Falls, N Y
Leighton & Co, Methol, N Y
Lewis Run Mfg Co, Bradford, Pa
Liberty Wood Prod Co, Port Allegheny, Pa
Luzerne Chem Co, Pittston Pa
McKean Chem Co, Williamsport, Pa
Maplewood Chem Co, Shinhopple, N Y
Marvindale Chem Co Marvindale, Pa
Maryland Wood Prod Co, Maryland, N Y
Michigan Iron & Chem Co, Chicago
Mid-Continental Iron Co, Kansas City
Milanville Chem Co, Milanville, Pa
Miss Wood Prod Co, Charleston, Miss
Mt Hope Chem Charcoal Wks, Mt Hope, Pa
Nansen Chem Co, Nansen, Pa
Natl. Chem Co, Bradford, Pa
Oregon Wood Dist Co, Portland, Ore
Otto Chem. Co., Williamsport, Pa
Penn Chem Co., Ridgeway, Pa.
Pierce & Stevens, Buffalo
Rieffer & Sons, Honesdale, Pa
Risley Lum Co, Walton, N Y
Russell Chem Co, Russell, Pa.
Shelby Chem Co., Shelby, Ala
Smith, J. B, Chemical Co, Buffalo
Standard Chem. Co, Toronto
Starucca Chem. Co, Starucca, Pa
Straight Creek Chem Co, Olean, N Y
Sullivan Chem. Co, Acidalia, N Y
Treip, G H, & Co, Binghamton, N Y
Treys, George I, Cook Falls, N Y
Tupper Lake Chem Co, Smethport, Pa.
Tyler-Hall Chem Co, Hancock, N Y
Tyler-Hall Chem Co, Readburn, N Y
Wisconsin Chem Co, Phelps, Wis.
Wood Prod Co, Buffalo
Wright Chem Co, Ridgeway, Pa
Wyman Chem Co, Port Allegheny, Pa

CALCIUM ACETATE, C. P. "BAKER'S ANALYZED"

Baker, J. T., Chemical Co., Phillipsburg, N J . . . 1095

CALCIUM ACETATE PLANTS.

See Wood Distillation Equipment

CALCIUM ARSENATE

Chipman Chemical Engineering Co., Inc., New York 1107
Dow Chemical Co., Midland, Mich 1114
Will Corporation, Rochester, N Y 972-1066
Acme Labs, Toronto
Ansbacher, A B, & Co, New York
Cowan, John, Chem Co, Montreal
Nitrate Agencies Co, New York

CALCIUM ARSENATE, C. P. "BAKER'S ANALYZED"

Baker, J. T., Chemical Co., Phillipsburg, N J . . . 1095

CALCIUM ARSENITE

Chipman Chemical Engineering Co., Inc., New York 1107

CALCIUM BISULFITE

Cooper, Chas., & Co., New York . 1111
Cowan, John, Chem. Co., Montreal

CALCIUM BROMIDE PAGE

Dow Chemical Co., Midland, Mich.. 1114
Powers- Weightman - Rosengarten Co., Philadelphia 1172
Will Corporation, Rochester, N. Y. 972-1066

CALCIUM BROMIDE, C. P. "BAKER'S ANALYZED"

Baker, J. T., Chemical Co., Phillipsburg, N J 1095

CALCIUM CARBIDE

Canada Carbide Co., Ltd., Montreal 1104
International Oxygen Co., Newark, N J 597
Air Reduction Sales Co, New York
Natl. Carbide Corpn, Branwell, W Va.
Union Carbide Co, New York
Union Carbide Co, Welland, Ont
Wilson Carbide Co, St Catherines, Ont

CALCIUM CARBONATE

Note The following are firms handling powdered calcium carbonate of a high degree of purity for manufacturing and experimental purposes If in need of calcium carbonate in bulk (limestone) consult the list under "Calcium carbonate, crude"

Cooper, Chas., & Co., New York . 1111
Harshaw Fuller & Goodwin Co., Cleveland 1127
Klipstein, A., & Co., New York ... 1143
National Sales Co., Cincinnati . 1161
Security Cement & Lime Co., Hagerstown, Md 1180
Will Corporation, Rochester, N Y 972-1066
Can Salt Co, Windsor, Ont
Hachmeister - Lind Chem. Co, Pittsburgh
Mt Joy Magnesia Co, Mt Joy, Pa
Merck & Co, New York
Product Sales Co, Baltimore
Squibb, E R, & Sons, New York
Valley Marl & Lime Corpn, Roanoke, Va
Vanderbilt, R T, Co, New York
Whittaker, Clark & Daniels, New York

CALCIUM CARBONATE, C. P. "BAKER'S ANALYZED"

Baker, J. T., Chemical Co., Phillipsburg, N J 1095

CALCIUM CARBONATE (ICELAND SPAR), "BAKER'S"

Baker, J. T., Chemical Co., Phillipsburg, N J . 1095

CALCIUM CARBONATE, CRUDE (LIMESTONE)

Mitchell Lime Co., Chicago, Ill 1157
Palmer Lime & Cement Co., New York 1167
Peerless White Lime Co., St Louis 1168
Security Cement & Lime Co., Hagerstown Md 1180
Solvay Process Company, Syracuse, N Y 1186-1189
Agric & Coml Lime Co, Canton, O
Allwood Lime Co Chicago
Arrowhead Mfg Co, St Louis
Atlas Mineral Prod Co, Lincoln, N J
Austin White Lime Co, Austin, Tex
Black White Lime Co, Quincy, Ill
Bushey & Son, G M, Cavetown, Md
Can Chem Prod Co, Montreal
Canyon Lime Co, Hot Springs, N M
Chazy Marble Lime Co, Chazy, N Y
Chem. Lime Co, Bellefonte, Pa
◈Cheney Lime Co, Allgood, Ala.
Courchesne, A, El Paso, Tex
Dewey Portland Cement Co, Kansas City
Glencoe Lime & Cement Co, St. Louis
Grove, M J., Lime Co, Lime Kiln, Md
Hoosac Valley Lime Co, Adams, Mass
Independent Lime & Stone Co, Drucker, Wis.
Indus. Limestone Co, Bethlehem, Pa
Leesburg Lime Co, Leesburg, Va.
Mayville White Lime Wks, Mayville, Wis.
Michigan Limestone & Chem. Co, Rogers City, Mich.
Northern Lime & Stone Co., Petoskey, Mich
Ontario Limestone & Clay Co., Belleville, Ont.
Pittsburgh Plate Glass Co., Barberton, O

CALCIUM CARBONATE, CRUDE (LIMESTONE)—Con. PAGE

Pittsfield Lime & Stone Co., New York
Rockfield Prod Co., Milwaukee
Rockland & Rockport Lime Co., Rockland, Me
Sheboygan Lime Wks, Sheboygan, Wis
Standard Chem. Co, Toronto
Standard Lime & Stone Co., Fond du Lac, Wis.
Warner, Chas, Co, Phila
Whiterock Quarries, Bellefonte, Pa

CALCIUM CHLORIDE

Cooper, Chas., & Co, New York. .. 1111
Dow Chemical Co., Midland, Mich. 1114
Grasselli Chemical Co., Cleveland 1125
Harshaw Fuller & Goodwin Co., Cleveland . . 1127
Klipstein, A, & Co., New York .. 1143
Marshall Richa, Inc., Baltimore 692
Mathieson Alkali Works, New York 1152
National Sales Co., Cincinnati 1161
Powers - Weightman - Rosengarten Co., Philadelphia 1172
Roessler & Hasslacher Chemical Co., New York . . . 1178-1179
Solvay Process Company, Syracuse, N Y 1186-1189
Will Corporation, Rochester, N Y 972-1066
Amer Calcium Chloride Wks, Hartford, W Va.
◈Baker, H J, & Bro, New York
Bush, Beach & Gent, New York
Columbia Chem Div, Pittsburgh
◈Drackett, P W, & Sons Co, Cincinnati
Eastman Salt Prod Co, Saginaw, Mich
Great Western Electrochem Co., San Fran
Greeff R W, & Co, New York
Hill, A W, Chem Co, Los Angeles
◈Rockhill & Victor, New York
Saginaw Chem Co, Saginaw, Mich
Seydel Mfg Co, Jersey City
Stauffer Chem Co San Fran
◈Stresen, Reuter & Biser, Chicago
Whittaker, Clark & Daniels, New York

CALCIUM CHLORIDE, C. P. "BAKER'S ANALYZED"

Baker, J. T., Chemical Co., Phillipsburg, N J 1095

CALCIUM CHLORIDE PLANTS

Cannon-Swenson Co., Chicago 384-385
Perry & Webster, Inc., New York 760-761

CALCIUM CITRATE

Calif Citrus By-Products Co, Anaheim, Cal

CALCIUM CYANAMIDE.

See "Cyanamid"

CALCIUM FERROCYANIDE

Bower, Henry, Chem. Mfg Co, Phila

CALCIUM FLUORIDE

Will Corporation, Rochester, N Y 972-1066
Foote Mineral Co, Phila.
Wiarda, John C, & Co, Bklyn

CALCIUM FLUORIDE, C. P. "BAKER'S ANALYZED"

Baker, J. T., Chemical Co., Phillipsburg, N J 1095

CALCIUM FLUOSILICATE.

See Calcium Silicofluoride

CALCIUM FORMATE

Trojan Powder Co, Allentown, Pa

CALCIUM GLYCEROPHOSPHATE

Klipstein, A., & Co., New York.... 1143
Merck & Co, New York
Monsanto Chem Wks, St. Louis

CALCIUM HYDRATE.

See Calcium Hydroxide

CALCIUM HYDROXIDE

Daigger, A., & Co., Chicago . .. 428
Mitchell Lime Co., Chicago 1157
Palmer Lime & Cement Co., New York . . 1167
Peerless White Lime Co., St Louis 1168
Security Cement & Lime Co., Hagerstown, Md 1180
Amer. Gypsum Co, Port Clinton, O.
Basic Prod Co, Pittsburgh
Cheney Lime Co, Allgood, Ala
Glencoe Lime & Cement Co., St. Louis
Grand Rapids Plaster Co., Grand Rapids, Mich.

CALCIUM HYDROXIDE—Con.
Hannibal Lime Co., Hannibal, Mo
Kelley Island Lime & Transport Co, Cleveland
Marblehead Lime Co., Chicago
Merion Lime & Stone Co, Norristown, Pa
Ohio & Western Lime Co, Huntington, Ind.
Rock Plaster Mfg Co, New York
Sargent, Chas R, Co, Cleveland
Smith Lime Flour Co, Elizabeth, N J
Whittaker, Clark & Daniels, New York

CALCIUM HYPOCHLORITE. See Bleach

CALCIUM HYPOPHOSPHATE
Merck & Co, New York

CALCIUM LACTATE
Heyden Chemical Co., Garfield, N J 1131
Hummel & Robinson Corpn., New York ... 1135
Dissosway Chem Co, Bklyn

CALCIUM LACTOPHOSPHATE
Dissosway Chem Co, Bklyn.
Merck & Co, New York

CALCIUM LINOLEATE
Meyer, J., & Sons, Philadelphia . . 1155
Fales, W H, Co, Bklyn
Scheel, Wm H, New York

CALCIUM-MAGNESIUM CHLORIDE
Dow Chemical Company, Midland, Mich 1114
Dickinson, J Q & Co, Malden, W. Va
Greeff, B W, & Co, New York
Kanawha River Salt & Chem Div, Charleston W Va
O River Salt Co, Mason W Va
Saginaw Chem Co, Saginaw, Mich
Schapper Chem Co, Chicago

CALCIUM, METAL
General Electric Co., Schenectady, N. Y. .. 508-514

CALCIUM MOLYBDATE
Steel Alloys Company, Los Angeles

CALCIUM NITRATE
Will Corporation, Rochester, N Y 972-1066
Garrigues, Chas F Co, New York

CALCIUM NITRATE, C. P. "BAKER'S ANALYZED"
Baker, J. T., Chemical Co., Phillipsburg, N J 1095

CALCIUM OLEATE
Natl Oil Prod Co, Harrison, N. J

CALCIUM OXIDE (FROM MARBLE) "BAKER'S"
Baker, J. T., Chemical Co., Phillipsburg, N J . . . 1095

CALCIUM OXIDE, TECHNICAL (LIME)
Mitchell Lime Co., Chicago 1157
Palmer Lime & Cement Co., New York 1167
Peerless White Lime Co., St Louis 1168
Security Cement & Lime Co., Hagerstown, Md 1180
Solvay Process Company, Syracuse, N Y 1186-1189
Agric & Coml Lime Co, Canton, O.
Allwood Lime Co, Chicago
Amer. Lime & Stone Co, Tyrone, Pa
Ash Grove Lime & Cement Co, Kansas City
Austin White Lime Co, Austin, Tex.
Barrick, S W, & Sons, Woodsboro, Md
Black White Lime Co, Quincy, Ill
Bushey, G. M, & Son, Cavetown, Md
Canyon Lime Co, Hot Springs, N M
Cedarville Lime Co, Cedarville, O
Chazy Marble Lime Co, Chazy, N Y.
Cheney Lime Co, Allgood, Ala
Courchesne, A, El Paso, Tex.
Dittinger Lime Co., New Braunfels, Tex
Finch, Pruyn & Co, Glens Falls, N. Y.
Glencoe Lime & Cement Co., St. Louis

CALCIUM OXIDE, TECHNICAL—(LIME)—Con.
Grove, M J, Lime Co, Lime Kiln, Md
Independent Lime & Stone Co, Duecker, Wis
Industrial Limestone Co, Bethlehem, Pa
Kelley Island Lime Co, Duluth, Minn
Knickerbocker Lime Co., Phila
Knoxville Sands Transport Co, Knoxville Tenn
Lee Lime Co, Lee, Mass
Leesburg Lime Co, Leesburg Va
Le Gore Combination Lime Co, Le Gore, Md
Lehigh Portland Cement Co, Allentown, Pa
Lorsong, Albert J, Hersey Shore, Pa
Marblehead Lime Co, Chicago
Mayville White Lime Works, Mayville, Wis
Menke, F W, Stone & Lime Co, Quincy Ill
Merion Lime & Stone Co, Norristown, Pa
Moores Lime Co, Springfield, O
Mt Franklin Fuel & Feed Co, El Paso Tex
Natl. Lime & Stone Co Carey, O
Natl Mortar & Supply Co, Pittsburgh
New England Lime Co, Adams, Mass
Northern Lime & Stone Co, Petoskey, Mich
O Hydrate & Supply Co, Woodville, O
O & Western Lime Co, Huntington, Ind
Ontario Limestone & Clay Co, Belleville Ont
Ozark White Lime Co, Fayetteville Ark
Pierce City Lime Co, Pierce City, Mo
Pittsfield Lime & Stone Co, New York
Roche Harbor Lime Co, Seattle
Rockland & Rockport Lime Co, Rockland Me
Scioto Lime & Stone Co, Delaware, O
Sheboygan Lime Work, Sheboygan, Wis
Smith Lime Flour Co, Elizabeth, N J
Standard Lime & Stone Co, Fond du Lac, Wis
Tacoma & Roche Harbor Lime Co, Roche Harbor, Wash
Vance Co, Winfield, Pa
Warner, Chas C, Wilmington
Washington Blk Lime Co, Balto
West Branch Lime Co, Williamsport, Pa
White Elk Lime Co, Pocatello, Idaho
White Marble Lime Co, Manistique Mich
Whiterock Quarries, Bellefonte, Pa
Whittaker, Clark & Daniels, New York
Woodville Lime & Cement Co, Toledo

CALCIUM PALMITATE
Natl Oil Prod. Co, Harrison, N J.

CALCIUM PERMANGANATE
Schapper Chem Co, Chicago
Stresen-Reuter & Biser, Chicago

CALCIUM PERBORATE
Roessler & Hasslacher Chemical Co., New York 1178-1179
Squibb, E R, & Sons, New York

CALCIUM PEROXIDE
Roessler & Hasslacher Chemical Co., New York . 1178-1179
Stresen-Reuter & Biser, Chicago

CALCIUM, PHOSPHATE, ACID
Davison Chemical Co., Baltimore 1113
Powers - Weightman - Rosengarten Co., Philadelphia .. 1172
Victor Chemical Works, Chicago 1207
Warner Chemical Company, New York 1209
Will Corporation, Rochester, N Y 972-1066
Alabama Chem. Co., Montgomery, Ala.
◆Alexander, G S, & Co, New York
Amer. Agric. Chem. Co., New York
Baugh Chem Co., Baltimore
Fed. Phosphorus Co, Anniston, Ala.
Higginson, J. F., Buckingham, P. Q

CALCIUM PHOSPHATE, ACID—Con.
Iliff-Bruff Chem. Co., Hoopeston, Ill.
Merck & Co, New York
Mountain Copper Co, San Fran.
Provident Chem. Wks., St. Louis
Rumford Chem Wks., Providence
Superior Phos Co, Joliet, Ill.
Wilckes-Martin-Wilckes Co, New York

CALCIUM PHOSPHATE, C. P. "BAKER'S ANALYZED"
Baker, J. T., Chemical Co., Phillipsburg, N J 1095

CALCIUM PHOSPHATE, DIBASIC
Victor Chemical Works, Chicago . 1207
Bardewyck, R, New York
Coignet Chem Prod Co., New York
Provident Chem Wks, St Louis
Wilckes-Martin-Wilckes Co, New York

CALCIUM PHOSPHATE, SUPER-
Davison Chemical Company, Baltimore 1113
Grasselli Chemical Co., Cleveland 1125
Anderson Phos & Oil Co, Anderson, S C
Barker Chem Co, Savannah
Caraleigh Phos & Fert. Wks, Raleigh, N C
Cotton States Seed & Fert Co., Macon, Ga
Empire State Chem Co, Athens, Ga.
Fed Phos Co, Anniston, Ala.
Independent Chem Co, New York
Internatl. Agric. Corpn, New York
Mountain Copper Co, San Fran.
Reliance Fert Co, Savannah
Royster, F S, Guano Co, Norfolk, Va.
Smith Agric Chem Co, Columbus, O
S Fert & Chem Co, Savannah
S States Phos & Fert. Co, Augusta, Ga
Swift & Co, Chicago
Victoria Chem. Co, Victoria, B C
Va-Car Chem Co, Richmond, Va

CALCIUM PHOSPHATE, TRIBASIC
Victor Chemical Works, Chicago.. 1207

CALCIUM RESINATE
Klipstein, A., & Co., New York.... 1143
Meyer, J., & Sons, Philadelphia .. 1155
Boehm, Fredk Ltd, New York
Gledhill, Chas F, Co, New York
Hachmeister - Lind Chem Co., Pittsburgh
National Oil Products Co, Harrison, N J

CALCIUM SALICYLATE
Heyden Chemical Co., Garfield, N. J. 1131

CALCIUM SILICOFLUORIDE
Genl Metallic Oxides Co, Jersey City

CALCIUM STEARATE
Klipstein, A., & Co., New York ... 1143
Meyer, J., & Sons, Philadelphia . 1155
Shepherd Chemical Co., Cincinnati. 1184
Fales, W H, Co, Bklyn
Hachmeister - Lind Chem Co, Pittsburgh
National Oil Products Co, Harrison, N J
Sloan & Russell, New York
Stearyte Company, Yonkers, N Y.

CALCIUM SULFATE
Cooper, Chas. & Co., New York .. 1111
General Chemical Co., New York. 1124
Grasselli Chemical Co., Cleveland 1125
Harshaw Fuller & Goodwin Co., Cleveland 1127
Industrial Chemical Co., Inc., New York 1136
Pennsylvania Salt Mfg. Co., Philadelphia .. 1169
Roessler & Hasslacher Chemical Co., New York 1178-1179
Victor Chemical Works, Chicago 1207
Will Corporation, Rochester, N Y 972-1066
Akron Gypsum Co, Akron, O
Amer. Gypsum Co., Rochester, N Y
Beggs, E J, & Co, New York
Best Bros, Keene's Cement Co, Medicine Lodge, Kan.
Black Hills Gypsum Co., Rapid City, S D.
Centerville Gypsum Co., Centerville, Ia.
Cheney & Son, Manlius, N. Y.

CALCIUM SULFATE—Con PAGE
Dissosway Chem Co, Bklyn
Fishack Gypsum Co., Toledo, O
Garbett Gypsum Co, Rochester, N Y
Hachmeister - Lind Chem Co, Pittsburgh
Iliff Bruff Chem Co., Hoopeston, Ill
Independence Gypsum Co, Enid Okla
Keystone Plaster Co, Chester, Pa
Lycoming Calcining Co, Garbutt, N Y
Mepham & Co, Geo. S, E St Louis, Ill
Merck & Co, New York
Nevada Gypsum Co., San Fran
Niagara Gypsum Co, Buffalo
Oatka Gypsum, Rochester, N Y
Pacific Coast Gypsum, Tacoma
Plymouth Gypsum Co, Ft Dodge, Ia.
S Gypsum Co, North Holston, Va
Stresen-Reuter & Biser, Chicago
W Gypsum Co, San Francisco
W. Paper Makers Chem Co, Kalamazoo
Whittaker, Clark & Daniels, New York
Whittaker Co, W H, New York
Williams & Co, C K, Easton, Pa.

CALCIUM SULFATE, C. P. "BAKER'S ANALYZED"
Baker, J. T., Chemical Co., Phillipsburg, N J 1095

CALCIUM SULFIDE
Will Corporation, Rochester, N Y 972-1066
Merck & Co, New York

CALCIUM SULFIDE, C. P. "BAKER'S"
Baker, J. T., Chemical Co., Phillipsburg, N J . . . 1095

CALCIUM SULFITE
Maas, A R, Chem Co, Los Angeles
Rumford Chemical Works, Providence, R I

CALCIUM SULFOCARBOLATE
Albany Chemical Company, Albany, N Y . . . 1087
Merck & Co, New York

CALCIUM SUPFERPHOSPHATE. See Calcium Phosphate

CALCIUM TUNGSTATE
Fansteel Prod Co, Chicago

CALCSPAR
Harshaw Fuller & Goodwin Co., Cleveland . . . 1127
Wiarda, John C, & Co, Bklyn

CALENDAR ROLLING MACHINES
Textile Finishing Machinery Co., Providence 884
Birmingham Iron Fdry, Derby, Conn

CALENDARS, EMBOSSING
'**Textile Finishing Machinery Co.**, Providence 884

CALENDAR ROLLS
Textile Finishing Machinery Co., Providence . . 884
Curtis & Marble Mach Co, Worcester, Mass
Holyoke Mach Works, Holyoke Mass
Lobdell Car Wheel Co, Wilmington
McKim Fdry & Mach. Co., Lockport, N. Y
Ticonderoga Mach. Wks, Ticonderoga, N. Y.

CALOGRAPHS, GAS, RECORDING
Precision Instrument Co., Newark, N J.... 782-783

CALOMEL. See Mercurous Chloride

CALORIMETERS, COAL, GAS AND STEAM
Bausch & Lomb Optical Co., Rochester, N Y 340-341
Brooklyn Thermometer Co., Brooklyn, N. Y 368
Claflin, Geo. L., Co., Providence, R. I. 405
Daigger, A., & Co., Chicago 428
Eimer & Amend, New York . .. 457
Emerson Apparatus Co., Melrose, Mass 467
Glass Specialty Co., Newark, N J 523
Griebel Instrument Co., Inc., Carbondale, Pa. 537

CALORIMETERS, COAL, GAS AND STEAM—Con PAGE
Marshall Richs, Inc., Baltimore... 692
Palo Company, New York........ 749
Precision Instrument Co., Newark, N J 782-783
Rovey Instrument & Chemical Co., Buffalo 814
Sarco Company, New York 819
Schaeffer & Budenberg Mfg. Co., Brooklyn, N Y . . . 820
Scientific Utilities Co., Inc., New York 826-827
Smith Gas Engineering Co., Dayton, O 836-837
Standard Calorimeter Co., East Moline, Ill 849
Standard Scientific Co., New York 852
Will Corporation, Rochester, N Y 972-1066

CALORIMETERS, "CARPENTER'S" SEPARATING AND THROTTLING STEAM
Schaeffer & Budenberg Mfg. Co., Brooklyn, N Y 820

CALORIMETERS, GAS, RECORDING
Smith Gas Engineering Co., Dayton, O 836-837
Cutler-Hammer Mfg Co, Milwaukee

CALORIMETERS, "PARR"
Standard Calorimeter Co., East Moline, Ill 849

CALORIMETERS, SPECIAL
Emerson Apparatus Co., Melrose, Mass 467
Standard Calorimeter Co., East Moline, Ill 849

CALORIZING OF METALS
General Electric Co., Schenectady, N Y 508-517

CALOTTES
Duriron Company, Dayton, O .450-453

CAMERAS, PHOTOMICROGRAPHIC
Bausch & Lomb Optical Co., Rochester N Y 340-341
Will Corporation, Rochester, N Y 972-1066

CAMERAS, PHOTOSTATIC
Photostat Co., Providence, R I.... 764

CAMERAS, SCIENTIFIC
Bausch & Lomb Optical Co., Rochester, N Y 340-341
Eimer & Amend, New York 457
Will Corporation, Rochester, N Y 972-1066

"CAMERON" CENTRIFUGALS AND PUMPS
Ingersoll-Rand Co., New York . 590-593

CAMPHOR
Daigger, A., & Co., Chicago.... 428
Jardine, Matheson & Co., New York 1140
Pfizer, Chas., & Co., Inc., New York 1170
Amer Camphor Ref Co, Boston
Frost, F W, & Co, New York
Magnus, Mabee & Reynard, New York
Nagase, D, & Co, New York
Rockhill & Vietor, New York
Sargent, Chas R, Co, Cleveland
S China Devel Synd, New York
Sparkhawk, Chas V, New York
Stresen-Reuter & Biser, Chicago

CAMS, SPLIT, FOR FLAT SCREENS
Glens Falls Mach. Wks., Glens Falls, N Y 526

CAMPHOR MONOBROMATE
Dow Chemical Co., Midland, Mich 1114
Dickinson, J G, & Co, Malden, W. Va
Merck & Co, New York

CAN CAPPING MACHINES
Pneumatic Scale Corpn., Norfolk Downs, Mass. 770-771

CAN FILLING MACHINES
American Machinery Co., Philadelphia 272
Hottman Machine Co., Philadelphia 576
Vilter Manufacturing Company, Milwaukee . .. 924
Waring, O. I., Filling Machine Co., New York 934
Automatic Weighing Machine Co., Newark, N. J
Mechanical Mfg. Co, Chicago

CAN HANDLING MACHINERY
Gifford-Wood Co., Hudson, N Y.. 522
Jeffrey Manufacturing Co., Columbus, O 606-607
Link-Belt Company, Chicago..... 667
Pneumatic Scale Corpn., Norfolk Downs, Mass. 770-771
Burt Mach. Co., Balto.

CAN-LABELING MACHINERY PAGE
Pneumatic Scale Corpn., Norfolk Downs, Mass. 770-771
Burt Mach. Co., Balto.
Economic Mach. Co., Worcester, Mass.
Jagenberg Mach. Co., New York

CANNING MACHINERY
Elyria Enameled Products Co., Elyria, O 466
Pfaudler Company, Rochester..... 762

CANS
Fidelity Can Company, Baltimore.. 477
Amer Can Co, New York
Continental Can Co, Syracuse
J S Giles & Sons, Chicago
Heekin Can Co, Cincinnati
Republic Can & Metal Co, Bklyn.
Southern Can Co., Balto.

CANS, FIBER
St Louis Paper Can & Tube Co, St. Louis

CANS, STORAGE
Stewart & Peterson Company, Burlington, N. J. 866

CANS, TIN, DECORATED
Fidelity Can Company, Baltimore. 477

CANS, TIN, FRICTION TOP
Fidelity Can Company, Baltimore. 477

CANS, TIN, JACKET
Fidelity Can Company, Baltimore. 477

CANS, TIN, PACKERS' SANITARY
Fidelity Can Company, Baltimore. 477

CANS, TIN, SCREW TOP
Fidelity Can Company, Baltimore. 477

CANS, TIN, SQUARE, 5 GALLON
Fidelity Can Company, Baltimore. 477

CANS, TIN, SQUARE OR ROUND
Fidelity Can Company, Baltimore. 477

CANS, TIN, WAX TOP
Fidelity Can Company, Baltimore. 477

CANDLE PITCH. See Pitch, Stearin

CAPPERS
Rice & Adams Corpn., Buffalo.... 804

CAPRINE
Synthetical Laboratories of Chicago, Chicago 1191

CAPS, RIDGE, "ROBERTSON PROCESS"
Robertson, H. H., Company, Pittsburgh 806-808

CAPSULE FILLING MACHINES
Colton, Arthur, Company, Detroit. 409
Stokes, F. J., Machine Company, Philadelphia 858-860

CAPSULES, LABORATORY
Coors Porcelain Co., Golden, Colo 414-415
Norton Company, Worcester, Mass. 731
Thermal Syndicate, Ltd., New York . . 886-889
Will Corporation, Rochester, N Y 972-1066

CAR LOADERS, PNEUMATIC
Guarantee Construction Co., New York 540-541

CAR PULLERS
Caldwell, H. W., & Son Co., Chicago 381
Gifford-Wood Co., Hudson, N. Y.. 522
Link-Belt Co., Chicago 667
Weller Mfg. Co., Chicago......... 941

CARAMEL
Bush, W. J., & Co., Inc., New York 1101
Fries & Fries Co., Cincinnati..... 1122
Dehls & Stein, Newark, N J
Henderson, Thomas, & Co., New York
Williamson, D. D, & Co., New York

CARBAZOLE
Barrett Company, New York...1096-1097
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- **Norristown Magnesia & Asbestos Co.,** Norristown Pa . 730
- **Quigley Furnace Specialties Co.,** New York 791
- **Warren Chemical Division,** New York 936
- Atlas Mineral Prod Co, Merztown, Pa
- Carey, Philip, Co, Lockland, O
- Denver Fire Clay Co, Denver
- Dixon, Jos, Crucible Co, Jersey City
- Foote Mineral Co, Phila
- Stowe Fuller Co, Cleveland

CEMENT, "FURNASEAL"
- **Laclede-Christy Clay Products Co.,** St Louis 654

CEMENT, GAS RETORT PATCHING
- **Laclede-Christy Clay Products Co.,** St Louis 654

CEMENT, HIGH TEMPERATURE
- **Brooklyn Fire Brick Works,** Brooklyn, N Y 367
- **Laclede-Christy Clay Products Co.,** St Louis 654
- **Pyrolectric Instrument Co.,** Trenton, N J . . . 790
- **Quigley Furnace Specialties Co.,** New York 791
- Atlas Mineral Prod Co, Merztown, Pa
- Bird-Archer Co, New York
- Denver Fire Clay Co, Denver
- Dixon, Jos, Crucible Co, Jersey City
- Foote Mineral Co, Phila
- Gravert, Wm J, Long Island City, N Y

CEMENT, HIGH TEMPERATURE, "ARCHNU"
- **Laclede-Christy Clay Products Co.,** St Louis 654

CEMENT, HIGH TEMPERATURE "FIRE SEAL"
- **Brooklyn Fire Brick Works,** Brooklyn, N Y 367

CEMENT, HIGH TEMPERATURE "VOLCANO"
- Gravert, Wm J, Long Island City, N Y.

CEMENT, "HYTEMPITE"
- **Quigley Furnace Specialties Co.,** New York ,.. 791

CEMENT, INSULATING
- **Armstrong Cork & Insulation Co.,** Pittsburgh 295-297
- **Celite Products Company,** New York 388-389
- **Norristown Magnesia & Asbestos Co.,** Norristown, Pa 730
- **Truscon Laboratories,** Detroit. ... 899
- **Wailes Dove - Hermiston Corpn.,** New York 931
- Condensite Co, Bloomfield, N J.
- Minwax Co, New York

CEMENT, LEATHER BELTING, WATERPROOF. See Cement, Belt

CEMENT, MAGNESITE
- Amer Refractories Co., Pittsburgh

CEMENT, MAGNESITE—Con. PAGE
- Carey, Philip, Co., Lockland, O.
- Lavino, E. J. & Co, Phila.
- Stowe Fuller Co, Cleveland

CEMENT, COPPER OXYPHOSPHATE
- Stanley Chem Co., J. R, New York
- Whittaker, Clark & Daniels, New York

CEMENT, ZINC OXYPHOSPHATE
- Stanley Chem. Co., J. R, New York

CEMENT, PIPE - JOINT, TERRA COTTA
- **Barber Asphalt Paving Co.,** Philadelphia 1098
- **Warren Chemical Division,** New York 936

CEMENT, PLASTIC
- **Robertson, H. H., Co.,** Pittsburgh 806-808

CEMENT, PORTLANL
- **Pa!mer Lime & Cement Co.,** New York 1167
- **Security Cement & Lime Co.,** Hagerstown, Md 1180
- Alpha Portland Cement Co., Easton, Pa
- Atlas Portland Cement Co, New York
- Can Cement Co, Montreal
- Chicago Portland Cement Co., Chicago
- Clinchfield Portland Cement Corpn, Kingsport, Tenn
- Dixie Portland Cement Co, Chattanooga, Tenn
- Edison Portland Cement Co., Stewartsville, N J.
- Giant Portland Cement Co, Phila.
- Glencoe Lime & Cement Co, St. Louis
- Huron Portland Cement Co, Detroit
- Lehigh Portland Cement Co., Allentown, Pa
- Pacific Portland Cement Co, San Fran
- Sandusky Portland Cement Co., Sandusky, O
- Standard Portland Cement Co., San Fran
- Tidewater-Portland Cement Co., Baltimore
- Universal Portland Cement Co, Chicago
- U S Portland Cement Co, Kansas City, Mo
- Vulcanite Portland Cement Co., Phila

CEMENT, "REDMANOL"
- **Redmanol Chemical Products Co.,** Chicago 800

CEMENT, REFRACTORY
- **Barber Asphalt Paving Co.,** Philadelphia . . . 1098
- **Brooklyn Fire Brick Works,** Brooklyn, N Y . . 367
- **Laclede-Christy Clay Products Co.,** St Louis . 654
- **National Sales Co.,** Cincinnati. 1161
- **Norton Company,** Worcester, Mass 731
- **Pyrolectric Instrument Co.,** Trenton, N J 790
- **Warren Chemical Division,** New York 936
- Atlas Mineral Prod Co, Merztown, Pa
- Bour, J J, Refractories Co, Scranton, Pa
- Carborundum Co, Niagara Falls
- Clinton Metallic Paint Co, Clinton, N Y
- Dixon, Jos, Crucible Co, Jersey City
- Foote Mineral Co, Phila.
- Stowe Fuller Co, Cleveland

CEMENT, ROOFING
- **Barber Asphalt Paving Co.,** Philadelphia 1098
- **Warren Chemical Division,** New York 936

CEMENT, RUBBER
- **Cooper, Chas., & Co.,** New York.... 1111
- **New York Belting & Packing Co.,** New York 725
- Dewey & Almy Chem. Co, Cambridge, Mass
- Van Cleef Bros, Chicago

CEMENT, SILICA
- Rieha, Edward L, Baltimore

CEMENT, WATERPROOF
- **Armstrong Cork & Insulation Co.,** Pittsburgh 295-297
- **Barber Asphalt Paving Co.,** Philadelphia 1098
- **Fries & Fries Co.,** Cincinnati. 1122
- **Truscon Laboratories,** Detroit 899
- **Wailes Dove - Hermiston Corpn.,** New York 931
- **Warren Chemical Division,** New York 936

The Symbol "◈" before firms not using space to describe their facilities indicates that the firm is not a manufacturer of the item mentioned. For Alphabetical List of Firms using catalog space see page 12

CEMENT, WATERPROOF—Con
Amer Cellulose Co, Indianapolis
Minwax Co., New York
Morene Products Co, New York
Standard Paint Co., New York
Texas Co., New York
Toch Bros., New York
Van Schaack Bros Chem Wks., Chicago

CEMENT, "ZIRKITE"
Foote Mineral Co., Phila

CEMENT MILL MACHINERY
American Tool & Machine Co., Boston 282-283
Bartlett, C. O., & Snow Co., Cleveland 338
Caldwell, H. W., & Son Co., Chicago 381
Gifford-Wood Company, Hudson N Y 522
Hardinge Company, New York 544-545
Jeffrey Manufacturing Co., Columbus, O 606-607
Kent Mill Company, Brooklyn N Y 630
Link-Belt Company, Chicago 667
Meade, Richard K., & Co., Baltimore 696
Newbold, R. S., & Sons Co., Norristown, Pa 722
Pennsylvania Crusher Co., Philadelphia 751
Ruggles - Coles Engineering Co., New York 818
Stroud, E. H., & Co., Chicago 861
Struthers-Wells Co., Warren Pa 864 865
Tippett & Wood, Phillipsburg N J 891
Weller Manufacturing Co., Chicago 941

CEMENT PRESERVATIVE COMPOUNDS
Truscon Laboratories, Detroit 899
Wailes Dove - Hermiston Corpn., New York 931

CEMENT TESTING APPARATUS. See Testers, Cement

CEMENTOL
Boehm, Fredk., Ltd., New York

CENTRALINE BLACK BH
Metz, H. A., & Co., Inc., New York 1154
Central Dyestuff & Chem Co., Newark, N J

CENTRALINE BLUE 2B
Metz, H. A., & Co., Inc., New York 1154
Central Dyestuff & Chem Co., Newark, N J

CENTRALINE BLUE 3B
Metz, H. A., & Co., Inc., New York 1154
Central Dyestuff & Chem Co., Newark, N J

CENTRALINE FAST RED F
Metz, H. A., & Co., Inc., New York 1154
Central Dyestuff & Chem Co., Newark, N J

CENTRALINE VIOLET N
Metz, H. A., & Co., Inc., New York 1154
Central Dyestuff & Chem Co., Newark, N J

CENTRIFUGAL EXTRACTORS. See Centrifugals

CENTRIFUGALS, ANALYTICAL. See Centrifugals, Laboratory

CENTRIFUGALS, CLARIFYING
American Tool & Machine Co., Boston 282-283
Consolidated Products Co., New York 411
Cresson-Morris Company, Philadelphia 422-423
Fletcher Works, Philadelphia 482-483
Glander & Company, Newark, N J 524-525
International Equipment Co., Boston 596
Tolhurst Machine Works, Troy, N. Y 896-897
U. S. & Cuban Allied Works Engineering Corpn., New York 920
De Laval Separator Co., New York
Kaestner & Hecht Co., Chicago
Sharples Specialty Co., Phila

CENTRIFUGALS, CLARIFYING AND FILTERING
Cresson-Morris Company, Philadelphia 422-423
U. S. & Cuban Allied Works Engineering Corpn., New York 920
De Laval Separator Co., New York
Sharples Specialty Co., Phila

CENTRIFUGALS, CONTINUOUS
Elmore, G. H., Philadelphia 464

CENTRIFUGALS, DEHYDRATING (DRYING)
American Tool & Machine Co., Boston 282-283
Cresson-Morris Company, Philadelphia 422-423
Elmore, G. H., Philadelphia 464
Fletcher Works, Philadelphia 482-483
Glander & Company, Newark, N.J 524-525
Hepworth, S. S., Company, New York 554
Link-Belt Co., Chicago 667

CENTRIFUGALS, DEHYDRATING (DRYING)—Con.
Tolhurst Machine Works, Troy, N. Y 896-897
U. S. & Cuban Allied Works Engineering Corpn., New York 920
De Laval Separator Co., New York
Kaestner & Hecht Co., Chicago

CENTRIFUGALS, HAND POWER
American Tool & Machine Co., Boston 282-283
International Equipment Co., Boston 596
Tolhurst Machine Works, Troy, N Y 896-897
Boulin Camille H, New York
De Laval Separator Co., New York
Sharples Specialty Co., Phila

CENTRIFUGALS, INDUSTRIAL
American Tool & Machine Co., Boston 282-283
Buffalo Forge Co., Buffalo 373
Consolidated Products Co., New York 411
Cresson-Morris Company, Philadelphia 422-423
Elmore, G. H., Philadelphia 464
Fletcher Works, Philadelphia 482-483
Glander & Company, Newark N J 524-525
Hepworth, S. S., Company, New York 554
Ingersoll Rand Co., New York 590-593
International Equipment Co., Boston 596
Ott, George F., Co., Philadelphia 744
Tolhurst Machine Works, Troy N Y 896-897
U. S. & Cuban Allied Works Engineering Corpn., New York 920
De Laval Separator Co., New York
Kaestner & Hecht Co., Chicago
Sharples Specialty Co., Phila

CENTRIFUGALS, LABORATORY
American Tool & Machine Co., Boston 282-283
Bausch & Lomb Optical Co., Rochester N Y 340-341
Brooklyn Thermometer Co., Brooklyn, N Y 368
Claflin, Geo. L., Co., Providence 405
Eimer & Amend, New York 457
Fletcher Works, Philadelphia 482-483
Glass Specialty Co., Newark N J 523
International Equipment Co., Boston 596
Marshall Rieha, Inc., Baltimore 692
Mine & Smelter Supply Co., New York 704-705
Palo Company, New York 719
Rovey Instrument & Chemical Co., Buffalo 811
Scientific Instrument Co., New York [illegible]
Standard Scientific Co., New York [illegible]
Tolhurst Machine Works, Troy N Y 896-897
Will Corporation, Rochester, N Y 972-1066
De Laval Separator Co., New York
Heil Henry Chem Co, St Louis
Reynolds Teschner & Volk Co., New York
Sharples Specialty Co., Phila

CENTRIFUGALS, LABORATORY, CHAUANT'S "CYCLONE"
Boulin Camille H, New York

CENTRIFUGALS, "MACKINTOSH"
Hepworth, S. S., Company, New York 554

CENTRIFUGALS, "MORRIS - WESTON" BALL BEARING
Cresson-Morris Company, Philadelphia 422-423

CENTRIFUGALS, NITRATING
U. S. & Cuban Allied Works Engineering Corpn., New York 920

CENTRIFUGALS, OIL RECOVERY
American Tool & Machine Co., Boston 282-283
Oil & Waste Saving Mach Co., Phila

CENTRIFUGALS, OIL RECOVERY "ROPER"
American Tool & Machine Co., Boston 282-283

CENTRIFUGALS, SEPARATING
American Tool & Machine Co., Boston 282-283
Cresson-Morris Company, Philadelphia 422-423
Fletcher Works, Philadelphia 482-483
Glander & Company, Newark, N J 524-525
International Equipment Co., Boston 596
Tolhurst Machine Works, Troy, N Y 896-897
U. S. & Cuban Allied Works Engineering Corpn., New York 920
De Laval Separator Co., New York
Kaestner & Hecht Co., Chicago

CENTRIFUGALS, SEPARATING—Con.
Oil & Waste Saving Mach. Co., Phila.
Sharples Specialty Co., Phila.

CENTRIFUGALS, SEPARATING AND CLARIFYING
American Tool & Machine Co., Boston 282-283
Cresson-Morris Company, Philadelphia 422-423
Fletcher Works, Philadelphia 482-483
Tolhurst Machine Works, Troy, N Y 896-897
U. S. & Cuban Allied Works Engineering Corpn., New York 920
De Laval Separator Co., New York
Kaestner & Hecht Co., Chicago
Oil & Waste Saving Mach Co., Phila
Sharples Specialty Co., Phila.

CENTRIFUGALS, "WESTON"
American Tool & Machine Co., Boston 282-283

CENTRIFUGES. See Centrifugals

CEPHALIN
Wilson & Co., Chicago 1211

CERAMIC COLORS. See Colors, Ceramic

CERESIN
Lamson, John S., & Bro., New York 1146
Union Chemical Co., Boston 1198

CERIC-AMMONIUM NITRATE
Welsbach Co., Gloucester, N J 1210
Lindsay Light Co., Chicago

CERIC-AMMONIUM SULFATE
Lindsay Light Co., Chicago

CERIUM CARBONATE
Welsbach & Co., Gloucester, N. J. 1210
Foote Mineral Co., Phila
Lindsay Light Co., Chicago

CERIUM CHLORIDE
Synthetical Laboratories of Chicago, Chicago 1191
Welsbach & Co., Gloucester, N J 1210
Foote Mineral Co., Phila
Lindsay Light Co., Chicago

CERIUM FLUORIDE
Welsbach & Co., Gloucester, N. J. 1210
Lindsay Light Co., Chicago

CERIUM HYDRATE
Lindsay Light Co., Chicago

CERIUM-IRON. See Ferrocerium

CERIUM METAL
Foote Mineral Co., Phila.
New Process Metals Corpn., Newark, N J

CERIUM NITRATE
Hummel & Robinson Corpn., New York 1135
Welsbach Co., Gloucester, N J 1210
Atkins, David J., New York
Foote Mineral Co., Phila
Harrison Mfg Co., Rahway, N J.
Lindsay Light Co., Chicago
Standard Chem Co., Bayonne, N J

CERIUM OXALATE
Hummel & Robinson Corpn., New York 1135
Welsbach Co., Gloucester, N J 1210
Foote Mineral Co., Phila
Lindsay Light Co., Chicago
Merck & Co., New York

CERIUM OXIDE
Welsbach Co., Gloucester, N. J. 1210
Foote Mineral Co., Phila
Lindsay Light Co., Chicago

CERIUM PHOSPHATE
Foote Mineral Co., Phila.

CERIUM SULFATE
Welsbach Co., Gloucester, N. J. 1210
Foote Mineral Co., Phila
Lindsay Light Co., Chicago

CESIUM CHLORIDE
Synthetical Laboratories of Chicago, Chicago 1191

CESIUM SALTS
Synthetical Laboratories of Chicago, Chicago 1191
Foote Mineral Co., Phila

CESIUM SILICATE
Foote Mineral Co., Phila.

CEYLON RED
National Aniline & Chemical Co., Inc., New York 1159

CHADDOCK'S SUPPORTS AND CLAMPS. See Laboratory Apparatus and Supplies

"CHAINOMATIC" BALANCES. See Balances, "Chainomatic"

CHAINS
Caldwell, H. W., & Son Co., Chicago 381
Dow Co., Louisville, Ky 444

CHAINS—Con.
Jeffrey Manufacturing Co., Columbus, O . .606-607
Link-Belt Company, Chicago . 667
Morse Chain Company, Ithaca, N Y 712
Webster Manufacturing Co., Chicago . 940
Weller Manufacturing Co., Chicago 941

CHAINS, ATERITE
Aterite Company, New York . . . 300-301

CHAINS, LINK BELT
Jeffrey Manufacturing Co., Columbus, O . . . 606-607
Link-Belt Company, Chicago . . 667

CHAINS, SILENT DRIVE
Jeffrey Manufacturing Co., Columbus O 606 607
Link-Bolt Company, Chicago 667
Morse Chain Company, Ithaca, N Y . 712
Weller Manufacturing Co., Chicago 941

CHAINS, STEEL ROLLER
Dow Co., Louisville Ky . 444
Gifford-Wood Co., Hudson, N Y 522
Jeffrey Manufacturing Co., Columbus, O 606-607
Link-Belt Company, Chicag 667
Ott, George F., Co., Philadelphia 744
Weller Manufacturing Co., Chicago 941

CHALK
Binney & Smith Co., New York 1099
Cooper, Chas., & Co., New York 1111
Crosthwaite, Ralph L., Co., New York 1112
Drakenfeld, B. F., & Co., Inc., New York 1115
Harshaw Fuller & Goodwin Co., Cleveland 1127
Industrial Chemical Co., Inc., New York 1136
Powers - Weightman - Rosengarten Co., Philadelphia . 1172
Baker, H J, & Bro, New York
◆Mepham, Geo S, & Co, E St Louis, Ill
◆Product Sales Co, Balto
Rockhill & Victor, New York
Whittaker, Clark & Daniels New York

CHAMBER PACKING, ACID-PROOF
Acid Proof Clay Products Co., Akron, O 248
Crescent Refractories Co., Curwensville, Pa 419
General Ceramics Co., New York 504-507
Hood, B. Mifflin, Brick Co., Atlanta, Ga . 569
Knight, Maurice A., E Akron, O 638 649

CHAMBER PLANTS. See Acid Plants, Sulfuric

CHAMBER PLANTS, DETAILS
Acid Proof Clay Products Co., Akron, O . 248
Fairlie, Andrew M., Atlanta 174
General Ceramics Co., New York 504-507
Hood, B. Mifflin, Brick Co., Atlanta, Ga . 569
Knight, Maurice A., East Akron, O 638-649
Marshall Rieha, Inc., Baltimore 692
Packards & James Fison (Thetford), Ltd., Ipswich, Eng 718
Thermal Syndicate, Ltd., New York 886-889

CHAMOTTES
Acid Proof Clay Products Co., Akron, O 248
General Ceramics Co., New York 504-507
Knight, Maurice A., East Akron, O 638-649
Chemical Construction Co, Charlotte, N C.

CHANCEL'S APPARATUS
Brooklyn Thermometer Co., Brooklyn, N. Y 368
Claflin, Geo. L., Co., Providence . 405
Daigger, A., & Co., Chicago . . 428
Eimer & Amend, New York 457
Glass Specialty Co., Newark, N J 523
Griebel Instrument Co., Carbondale, Pa. 537
Hiergesell Brothers, Philadelphia . 560
Marshall Rieha, Inc., Baltimore . 692
Palo Company, New York 749
Rovey Instrument & Chemical Co., Buffalo 814
Scientific Utilities Co., Inc., New York 826-827
Standard Scientific Co., New York 852
Will Corporation, Rochester, N. Y 972-1066

CHAPMAN PUMPS. See Pumps, Chapman

CHARCOAL
Binney & Smith Co., New York . 1099
Cooper, Chas., & Co., New York 1111
Harshaw, Fuller & Goodwin Co., Cleveland 1127
Industrial Chemical Co., Inc., New York 1136
Amer. Turpentine & Tar Co., New York
Barclay Chem. Co., Olean, N. Y.

CHARCOAL—Con.
Barnum Richardson Co., E Canaan, Conn.
Bartley, John, Mt. Alton, Pa.
Beerston Acetate Co, Olean, N. Y
Blue Ridge Wood Chem. Co, Charlestown, W Va.
Boyne City Chem. Co, Boyne City, Mich
Buckhannon Chem. Co., Olean, N Y
Burston Acetate Co, Olean, N Y
Cadillac Chem Co, Cadillac, Mich
Charcoal Iron Co of Amer, Detroit
Charcoal Supply Co, Chicago
Chatham Mfg Co, Savannah
Clawson Chem Co, Hallton Pa
Cleveland-Cliffs Iron Co, Cleveland
Collier, W C, & Sons, Binghamton, N Y
Corbett, M J, & Co, St Marys, Pa.
Corbett & Stuart, Corbett, N Y
Coryville Chem Co, Coryville, Pa
Crossley Chem Co, Bklyn
Cummer - Diggins Co, Cadillac, Mich
Day Chem Co, Westline, Pa
Delta Chem Co, Wells, Mich
East Jordan Chem Co, E Jordan, Mich
Fla Wood Prod Co, Jacksonville, Fla
Forest Chem Co, Sheffield, Pa
Forest Prod Chem Co, Memphis Tenn
Gaffney Wood Prod. Co, Walton, Pa
Garrigues, Chas F, Co, New York
Genesee Chem Co, Genesee, Pa
Gray, Wm S, & Co, New York
Grayling Wood Prod Co, Grayling, Mich
Heinemann Chem Co, Olean, N Y
Indus Dist Co, Waterloo, N Y
James Bros Mfg Co Kane, Pa
Kerry, Thos, Co, Hancock, N Y
Ky Wood Prod Co, Kragon, Ky
Keystone Wood Prod Co, Olean, N Y
Kinzua Valley Chem Co, Williamsport, Pa
Lacka Chem Co, Olean, N Y
Lamont Chem Co, Lamont Pa
Leighton Arthur, Co, Cook s Falls, N Y
Luzerne Chem Co, Pittston Pa
McKean Chem Co., Williamsport, Pa
MacKellars, R., Sons Co, Peekskill, N Y
Marvindale Chem Co, Marvindale, Pa
Md Wood Prod Co., Maryland, N Y.
Milanville Chem. Co, Milanville, Pa
Minard Run Oil Co, Bradford, Pa
Nanson Chem Co, Nansen, Pa
Natl Chem Co, Bradford Pa
Natl Electrolytic Co, Niagara Falls
Newman, E. B, Char. Co, New York
Newton Chem Co, Olean, N Y
Nordmont Chem. Co, Pittston, Pa
Nusbaum Chem. Co., Bradford, Pa
Oregon Wood Dist Co, Portland, Ore
Oswayo Chem Co, Bradford, Pa
Otto Chem. Co, Williamsport, Pa
Pensacola Tar & Turpentine Co, Gullpoint, Fla.
Penn Chem Co, Ridgway, Pa
Phipps Char Co, Ironton O
Pierce & Stevens, Buffalo
Pine Nene Prod. Co, Jacksonville, N C
Rowand, John R, Clementon, N J
Russell Chem. Co, Russell, Pa
Salzeber, Geo H, St. Louis
Sligo Furnace Co, St Louis
Smith, J B, Chem Co, Buffalo
Standard Chem. Co, Toronto
Starucca Chem. Co, Starucca, Pa
Straight Creek Chem. Co, Olean, N. Y
Sullivan Chem. Co., Acidalia, N. Y
Susquehanna Chem Co., Straight, Pa
Thayer, Martin, & Son, Boston

CHARCOAL—Con.
Tionesta Valley Chem Co, Mayburg, Pa
Treyz, George I., Cook Falls, N. Y.
Tupper Lake Chem Co, Tupper Lake, N Y
Tyler-Hall Chem. Co, Hancock, N Y
Vandalia Chem Co, Olean, N Y
Whittaker, Clark & Daniels, New York
Wittig, F, & Co, Milwaukee
Wood Prod Co, Buffalo
Wright Chem. Co, Ridgway, Pa
Wright, T B, & Co, Berlin, N. J
Wyman Chem Co, Port Allegheny, Pa
Wyo Chem Co, Pittston, Pa

CHARCOAL, ANIMAL (BONE, BLOOD, ETC.). See also Black, Bone
Binney & Smith Co., New York . . 1099
Cooper, Chas., & Co., New York . . 1111
Baugh & Sons Co, Phila
Buffalo Dental Mfg Co, Buffalo
Whittaker, Clark & Daniels, New York

CHARCOAL, POWDERED
Binney & Smith Co., New York . 1099
Industrial Chemical Co., Inc., New York . . 1136
Powers - Weightman - Rosengarten Co., Philadelphia 1172
Whittaker, Clark & Daniels, New York
Wright, T B, & Co, Berlin, N J

CHARCOAL, BY-PRODUCT, OVENS. See Ovens, Wood Distillation

CHEMCO COLORS
Chemical Company of Amer, New York

CHASERS. See Mills, Paint

"CHEMI STEEL" EQUIPMENT
Kellogg, M. W., Co., New York 622-623

CHEMICAL ENGINEERS. See Engineers, Chemical

CHEMICAL LIME. See Calcium Oxide, Technical

CHEMICAL MACHINERY. See under specific heads

CHEMICAL PLANTS. See under specific heads

CHEMICAL PROCESSES. See under specific heads

CHEMICAL REAGENTS. See Chemicals, fine, for reagent and laboratory purposes

CHEMICALS. See under specific heads

Note The firms listed under the name of any chemical in this index are usually those who supply a commercial grade of the article in large quantities It a small quantity of a very pure grade is required refer to the firms listed under the heading —**"Chemicals, Fine, for Reagent and Laboratory Purposes."** The firms under this heading can supply almost any known chemical, organic or inorganic, in small quantities in C P or U S P grades

CHEMICALS, FINE, FOR REAGENT AND LABORATORY PURPOSES
Baker, J. T., Chemical Co., Phillipsburg, N J 1095
Brooklyn Thermometer Co., Brooklyn, N Y 368
Claflin, Geo. L., Co., Providence, R I 405
Cooper, Chas., & Co., New York . 1111
Daigger, A., & Co., Chicago . . . 428
Eimer & Amend, New York . . 457
General Chemical Co., Baker & Adamson Works, New York . . 1124
Glass Specialty Co., Newark, N J . . 523
Heyl Laboratories, New York . 1132
LaMotte Chemical Products Co., Baltimore . 1144-1145
Marshall Rieha, Inc., Baltimore . 692
Pfizer, Chas., & Co., New York . 1170
Palo Company, New York . . . 749
Powers - Weightman - Rosengarten Co., Philadelphia . 1172
Rovey Instrument & Chemical Co., Buffalo 814
Standard Scientific Co., New York. 852
Synthetical Laboratories of Chicago, Chicago 1191
Will Corporation, Rochester, N Y. 972-1066

CHEMICALS, PHOTOSTAT
Photostat Corporation, Providence, R. I 764

"CHEMICO" CONCENTRATORS. See Concentrators, "Chemico"

The Symbol "◆" before firms not using space to describe their facilities indicates that the firm is not a manufacturer of the item mentioned. For Alphabetical List of Firms using catalog space see page 12

CHEMISTS, ANALYTICAL PAGE

This list is not intended as a directory. It is merely a reference to the users of space in this volume who have expert services to offer

Electrochemical Supply & Engineering Co., Philadelphia 460
Fairlie, Andrew M., Atlanta, Ga . 474
Lewis, Greene, McAdams & Knowland, Boston 664
Little, Arthur D., Inc., Cambridge, Mass . . 668
Meade, Richard K., & Co., Baltimore, Md 696
Meigs, Bassett, & Slaughter, Inc., Philadelphia 697

CHEMISTS, CONSULTING

This list is not intended as a directory It is merely a reference to the users of space in this volume who have expert services to offer

Electrochemical Supply & Engineering Co., Philadelphia . 460
Fairlie, Andrew M., Atlanta Ga 474
Lewis, Greene, McAdams & Knowland, Boston 664
Little, Arthur D., Inc., Cambridge, Mass 668
Meade, Richard K., & Co., Baltimore, Md 696
Meigs, Bassett, & Slaughter, Inc., Philadelphia . . . 697

CHEMISTS, INDUSTRIAL RESEARCH. See Chemists, Research

CHEMISTS, METALLURGICAL

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Fairlie, Andrew M., Atlanta, Ga 474
Lewis, Greene, McAdams & Knowland, Boston 664
Little, Arthur D., Inc., Cambridge, Mass . 668
Meade, Richard K., & Co., Baltimore, Md 696
Meigs, Bassett, & Slaughter, Inc., Philadelphia . 697

CHEMISTS, RESEARCH

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Fairlie, Andrew M., Atlanta, Ga 474
Lewis, Greene, McAdams & Knowland, Boston 664
Little, Arthur D., Inc., Cambridge, Mass 668
Meade, Richard K., & Co., Baltimore Md 696
Meigs, Bassett, & Slaughter, Inc., Philadelphia 697

"CHESAPEAKE CRANES"
Chesapeake Iron Works, Baltimore 398

CHESTNUT EXTRACT. See Extract Chestnut

CHESTNUT-OAK EXTRACT. See Extract, Chestnut-Oak

CHEWING GUM MACHINERY
Baker, Joseph, Sons & Perkins, Inc., White Plains, N Y 333
Werner & Pfleiderer Co., White Plains, N Y.... 942-943

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Roos, Chas. A., Inc., New York... 810
Standard Water Systems Co., New York 853
Vendome Copper & Brass Works, Louisville, Ky. 923
Walter, Theo. C., Jr., Newark, N. J. 933
Welded Steel Barrel Corpn., Detroit 433
Wheeler Condenser & Eng. Co., Carteret, N J 963
Whitlock Coil Pipe Co., Hartford.966-967

CONDENSERS, DISTILLING

Ross Heater & Mfg. Co., Buffalo... 813

CONDENSERS, EDUCTOR

Schutte & Koerting Co., Philadelphia 822-823

CONDENSERS, ELECTRICAL

General Electric Co., Schenectady, N. Y 508-517
Western Electric Co., New York .944-945
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.........946-961

CONDENSERS, ENAMELED

Elyria Enameled Products Co., Elyria, O 466
Mott, J. L., Iron Works, New York 713
Pfaudler Company, Rochester, N Y. 762
Stuart & Peterson Co., Burlington, N. J 866

CONDENSERS, JET

American Steam Pump Co., Battle Creek 279
Bartlett Hayward Co., Baltimore.. 337
Buffalo Steam Pump Co., Buffalo.. 373
Devine, J. P., Company, Buffalo. 436-437
Hercules Engineering Corpn., New York 556-559
Kilby Manufacturing Co., Cleveland 636
Nordberg Mfg. Co., Milwaukee 728-729
Oakland Copper & Brass Works, Oakland, Cal 732-733
Oat, Joseph, & Sons, Philadelphia. 735
Ross Heater & Mfg. Co., Buffalo.. 813
Schutte & Koerting Co., Philadelphia 822-823
Scott, Ernest, & Co., Fall River, Mass. 828
Sperry, D. R., & Co., Batavia, Ill..844-846
Union Steam Pump Co., Battle Creek, Mich 906-907
Vogt Brothers Mfg. Co., Louisville, Ky 926-927
Westinghouse Electric & Mfg. Co., East Pittsburgh 946-961
Wheeler, C. H., Mfg. Co., Philadelphia 964
Wheeler Condenser & Eng. Co., Carteret, N J 963
Worthington Pump & Machinery Corpn., New York.........1072-1075

CONDENSERS, JET, LOW HEAD

Ross Heater & Mfg. Co., Buffalo.. 813

CONDENSERS, JET, MULTI

Schutte & Koerting Co., Philadelphia 822-823

CONDENSERS, JET, RECTANGULAR

Wheeler Condenser & Engineering Co., Carteret, N. J.......... 963

CONDENSERS, LEAKLESS

Wheeler Condenser & Engineering Co., Carteret, N J 963

CONDENSERS, LIEBIG'S, BULB AND SPIRAL

Brooklyn Thermometer Co., Brooklyn, N Y.... 368
Claflin, Geo. L., Co., Providence... 405
Daigger, A., & Co., Chicago....... 428
Eimer & Amend, New York....... 457
Glass Specialty Co., Newark, N. J. 523
Griebel Instrument Co., Inc., Carbondale, Pa 537
Hiergesell Brothers, Philadelphia.. 560
Kimble Glass Co., Vineland, N J.. 637
Marshall Rieha, Inc., Baltimore .. 692
Mine & Smelter Supply Co., New York 704-705
Palo Company, New York 749
Rovey Instrument & Chemical Co., Buffalo 814
Scientific Utilities Co., Inc., New York 826-827
Standard Scientific Co., New York. 852
Will Corporation, Rochester, N. Y. 972-1066

CONDENSERS, NITRIC ACID

Acid Proof Clay Products Co., Akron, O 248
Bethlehem Foundry & Machine Corpn., New York 350-352
Bethlehem Foundry & Machine Co., South Bethlehem, Pa 353
Buffalo Foundry & Machine Co., Buffalo 374-379
Duriron Company, Dayton, O. 450-453
Fuller-Lehigh Company, Fullerton, Pa 492-493
General Ceramics Company, New York 504-507
Knight, Maurice A., East Akron, O.638-649

CONDENSERS, NITRIC ACID—Con PAGE
Rosedale Foundry & Machine Co., Pittsburgh 812
Thermal Syndicate, Ltd., New York 886-889

CONDENSERS, REFLUX
Abernethy, John F., Brooklyn N Y 246
Acme Coppersmithing Co., Chicago 249
Acid Proof Clay Products Co., Akron, O 248
American Lead Burning Co., New York . . . 271
Badger, E. B., & Sons Co, Boston . 310-329
Bethlehem Foundry & Machine Corpn., New York 350-352
Bethlehem Foundry & Machine Co., Bethlehem, Pa 353
Buffalo Foundry & Machine Co., Buffalo 374-379
Consolidated Products Co., New York . 411
Detroit Heating & Lighting Co., Detroit 433
. **General Ceramics Company,** New York 501-507
Glander & Company, Newark N J 524-525
Knight, Maurice A., East Akron, O 638-649
Lummus, Walter E., Co., Boston 674-681
Rosedale Foundry & Machine Co., Pittsburgh 812
Thermal Syndicate, Ltd., New York 886-889
Welded Steel Barrel Corpn., Detroit 433

CONDENSERS, STATIC
General Electric Co., Schenectady 508-517
Westinghouse Electric & Mfg. Co., East Pittsburgh 946-961

CONDENSERS, SURFACE
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Acme Coppersmithing Co., Chicago 249
Allbright-Nell Co., Chicago . 260
American Lead Burning Co., New York 271
Badger, E. B., & Sons Co., Boston 310-329
Bartlett, Haywood Co., Baltimore 337
Biggs Boiler Works Co., Akron, O 355
Brady, Jas. A., Foundry Co., Chicago . 364
Buffalo Foundry & Machine Co., Buffalo 374-379
Consolidated Products Co., New York . . 411
Devine, J. P., Company, Buffalo, N Y . .436-437
Dopp, H. W., Co., Buffalo 840-843
Dover Boiler Works, New York 439
Downingtown Iron Works, Inc., Downingtown, Pa 445
Glander & Company, Newark N J 524-525
Groen Mfg. Co., Chicago 538
Jacoby, Henry E. New York 603
Kellogg, M. W., Co., New York 622-623
Kilby Manufacturing Co., Cleveland . . 636
Kutztown Foundry & Machine Co., Philadelphia 652-653
Nordberg Mfg. Co., Milwaukee 728-729
Oat, Joseph & Sons, Philadelphia 735
Oldman Boiler Works, Buffalo 740
Pittsburgh-Des Moines Steel Co., Pittsburgh 769
Rosedale Foundry & Machine Co., Pittsburgh . . 812
Ross Heater & Mfg. Co., Buffalo 813
Scott, Ernest & Co., Fall River, Mass. 828
Sowers Mfg. Co., Buffalo 840-843
Sperry, D. R., & Co., Batavia, Ill 844-846
Standard Water Systems Co., New York 853
Stokes, F. J., Machine Co., Philadelphia . .858-860
Struthers-Wells Co., Warren, Pa 864-865
Union Steam Pump Co., Battle Creek, Mich. . . . 906-907
U. S. & Cuban Allied Works Engineering Corpn., New York 920
Vilter Manufacturing Co., Milwaukee . . 924
Warren City Tank & Boiler Co., Warren, O . 937
Westinghouse Elec. & Mfg. Co., East Pittsburgh . 946-961
Wheeler, C. H., Mfg. Co., Philadelphia . . 964
Wheeler Condensers & Eng. Co., Carteret, N J . 963
Worthington Pump & Machinery Corpn., New York . . 1072-1075
Zaremba Company, Buffalo. 1081-1084

CONDENSERS, STEAM, MARINE
Ross Heater & Mfg. Co., Buffalo. . 813

CONDENSERS, SPIROJECTOR
Worthington Pump & Machinery Corpn., New York 1072-1075

CONDENSERS, SYNCHRONOUS
General Electric Co., Schenectady, N Y 508-517
Westinghouse Elec. & Mfg. Co., East Pittsburgh 946-961

CONDENSERS, VACUUM PAGE
Acme Coppersmithing Co., Chicago 249
Allbright-Nell Co., Chicago. 260
Buffalo Foundry & Machine Co., Buffalo 374-379
Devine, J. P., Co., Buffalo 436-437
Garrigue, William, & Company, Chicago and New York 496-501
Glander & Company, Newark, N J. 524-525
Groen Mfg. Co., Chicago. 538
Ingersoll-Rand Co., New York . 590-593
Jacoby, Henry E., New York . 603
Kopperman, Joseph, & Sons, Philadelphia . . . 650
Oat, Joseph, & Sons, Philadelphia. . 735
Ott, George F., Co., Philadelphia . 744
Rosedale Foundry & Machine Co., Pittsburgh 812
Scott, Ernest & Co., Fall River, Mass 828
Sperry, D. R., & Co., Batavia, Ill 844-846
Stokes, F. J., Machine Co., Philadelphia 858-860
Stuart & Peterson Co., Burlington, N J 866
United Lead Company, New York 911-915
Westinghouse Elec. & Mfg. Co., East Pittsburgh 946-961
Wheeler, C. H., Mfg. Co., Philadelphia 964
Wheeler Condenser & Eng. Co., Carteret N J 963
Worthington Pump & Machinery Corpn., New York 1072-1075

CONDENSERS, VERTICAL
Wheeler Condenser & Eng. Co., Carteret, N J 963

CONDENSERS, WELDED
Power Piping Co, Pittsburgh 776-777

CONDENSING APPARATUS. See Condensers

"CONDENSITE"
Condensite Co, Bloomfield N J

CONDENSITE CELORON
Diamond State Fibre Co., Bridgeport, Pa 435

CONDUCTORS, ELECTRICAL, ALUMINUM
Aluminum Co of Amer Pittsburgh

CONDUIT, SECTIONAL, PIPE COVERING
Winslow & Company, Portland, Me 1069

CONDUIT, STEEL, FLEXIBLE
Sprague Electric Works, New York 847

CONDUITS, WOOD, CREOSOTED
Michigan Pipe Co., Bay City, Mich 702

CONES, CLASSIFYING
Tippett & Wood, Phillipsburg, N J 891
Allis-Chalmers Mfg Co, Milwaukee
Merrill Metallurgical Co San Fran

CONES, CONCENTRATING
Tippett & Wood, Phillipsburg, N J 891
Allis-Chalmers Mfg Co, Milwaukee
Merrill Metallurgical Co, San Fran

CONES, FILTER, ALUNDUM
Norton Company, Worcester, Mass 731
Will Corporation, Rochester, N Y 972-1066

CONES, FILTER, PLATINUM
American Platinum Works, Newark, N J 275
Baker & Co., Inc., Newark, N J 332
Bishop, J., & Co., Platinum Works, Malvern, Pa 356
Eimer & Amend, New York 457
Will Corporation, Rochester, N Y 972-1066

CONES, STONEWARE
Acid Proof Clay Products Co., Akron, O 248
General Ceramics Company, New York . 504-507
Knight, Maurice A., East Akron, O 638-649

CONGO BLUE
Heyl Laboratories, New York 1132

CONGO CORINTH
Monroe Drug Co, Quincy, Ill

CONGO RED
Heller & Merz Co., New York 1128
Newport Chemical Works, Inc., Passaic, N J 1164-1165
Althouse Chem Co, Reading, Pa
Dicks, David, Co, New York

CONGO RED 4B
Newport Chemical Works, Inc., Passaic, N J . 1164-1165
Althouse Chem Co, Reading, Pa

CONSTRUCTION AND DESIGN OF PLANTS

Note—Some of the firms in this list are prepared to undertake the construction of any kind of industrial plant, others specialize to a great extent on certain lines of manufacture. Time will be saved by consulting their pages before corresponding.

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Badger, E. B., & Sons Co., Boston 310-329
Bethlehem Foundry & Machine Co., South Bethlehem, Pa . . . 353
Blaw-Knox Company, Pittsburgh 358-361
Buffalo Foundry & Machine Co., Buffalo . 374-379
Cannon-Swenson Co., Chicago .384-385
Cresson-Morris Company, Philadelphia .422-423
Distillation Industries, New York 491
Electro-Chemical Supply & Engineering Co., Philadelphia . 460
Fairlie, Andrew M., Atlanta Ga 474
Garrigue, William, & Company, Chicago and New York 496-501
General Ceramics Company, New York . 501-507
General Machine Company, Newark, N J 518-519
Glander & Company, Newark, N J 524-525
Guarantee Construction Co., New York . . . 540-541
Hardinge Company, New York 544-545
Hercules Engineering Corpn., New York . . 556-559
Hope Engineering & Supply Co., Mt Vernon O 572
International Oxygen Co., Newark, N J . 597
Isbell-Porter Co., Newark N J 600
Knight, Maurice A., East Akron, O 638-649
Koven, L. O., & Brother, Jersey City, N J . . 651
Lasker Iron Works, Chicago 660
Lewis, Green, McAdams & Knowland, Boston 664
Lummus, Walter E, Co., Boston 674-681
Malcomson Eng. & Machine Corpn., Chicago 687
Mantius Engineering Co., Inc., New York 688-689
Meade, Richard K., & Co., Baltimore . 696
Nordberg Mfg. Co., Milwaukee 728-729
Oakland Copper & Brass Works, Oakland Cal 732-733
Perry & Webster, Inc., New York 760-761
Pittsburgh-Des Moines Steel Co., Pittsburgh 769
Scott, Ernest & Co., Fall River, Mass . 828
Surface Combustion Co., New York 874-875
Thatcher, John, & Son, Brooklyn, N Y 885
Thermal Syndicate, Ltd., New York 886-889
U. S. Cuban Allied Works Engineering Corpn., New York 920
Vendome Copper & Brass Works, Louisville 923

CONSTRUCTION ENGINEERS. See Engineering Contractors

CONTACT-MAKING DEVICES
General Electric Co., Schenectady, N Y . 508-517
Raymond Engineering Corpn., New York . . 794

CONTACT PROCESS PLANTS. See Acid Plants, Sulfuric

CONTACTS, CARBON
Speer Carbon Co, St Marys, Pa

CONTACTS, GOLD
Wall, H T, Co, Providence

CONTACTS, GRAPHITE
Acheson Graphite Co., Niagara Falls . 247

CONTACTS, IRIDIUM
Bishop, J., & Co., Platinum Works, Malvern Pa . 356
Johnson, Mathey & Co., New York 613
Wilson, H A, Co, Newark N J

CONTACTS, PLATINO-IRIDIUM
Johnson, Matthey & Co., New York 613
Roessler & Hasslacher Chemical Co., New York 1178-1179
Wilson, H A, Co, Newark, N J

CONTACTS, PLATINUM
American Platinum Works, Newark, N. J . . . 275
Baker & Company, Inc., Newark, N J . 332
Bishop, J., & Co., Platinum Works, Malvern, Pa 356
Johnson, Matthey & Co., New York 613
Roessler & Hasslacher Chemical Co., New York. 1178-1179
Wilson, H A, Co, Newark, N. J

CONTACTS, SILVER
Wilson, H. A., Co, Newark, N. J.

CONTACTS, TUNGSTEN PAGE
General Electric Co., Schenectady, N. Y. .508-517
Fansteel Prod. Co., Chicago, Ill.

CONTAINERS, CORRUGATED FIBER
Hinde & Dauch Paper Co., Sandusky, O. 561
Buffalo Box Factory, Buffalo
Gair, Robert, Co., New York
Ft. Wayne Corrug. Paper Co., Ft. Wayne, Ind.
Hunt-Cranford Co., Coshocton, O.

CONTAINERS, CORRUGATED, FIBER OR PAPER, MACHINERY
Langston, Samuel M., Co., Camden, N. J.

CONTAINERS, FIBER
Snyderfiba Corporation, Newark, N. J. 839

CONTAINERS, FIBER MACHINERY
Snyderfiba Corporation, Newark, N. J. 839

CONTAINERS, FORGE-WELDED, ONE TON
American Welding Co., Carbondale, Pa. [illegible]

CONTAINERS, HAMMER-WELDED
Kellogg, M. W., Co., New York 622-623

CONTAINERS, SEAMLESS, STEEL
International Oxygen Co., Newark, N. J. 597

CONTAINERS, TIN
Fidelity Can Company, Baltimore 477

CONTRACTORS, PIPING
American Foundry & Construction Co., Pittsburgh 266-267
Clow, James B., & Sons, Chicago [illegible]
Dougherty, M. J., Co., Philadelphia 442-443
Fleisher, W. L., & Co., Inc., New York 480-481
Grinnell Company, Inc., Providence 532-536
Hoyt Metal Co., St. Louis [illegible]
Kellogg, M. W., Co., New York 622-623
Michigan Pipe Company, Bay City, Mich. 702
Mitchell, W. K., & Co., Philadelphia 703
Parks-Cramer Company, Fitchburg, Mass. 750
Pittsburgh Valve, Foundry & Construction Co., Pittsburgh 766-768
Power Piping Company, Pittsburgh 776-777
Reading Iron Co., Reading 796-797

CONTRACTORS' EQUIPMENT
Blaw-Knox Company, Pittsburgh 358-361
Haiss, George, Mfg. Co., New York 542-543
Hunt, C. W., Co., Inc., West New Brighton, N. Y. 582-583
Jeffrey Manufacturing Co., Columbus, O. 606-607
Link-Belt Company, Chicago 667

CONTRACTORS', EQUIPMENT, CONVEYING
Standard Conveyor Co., North St. Paul, Minn. 851

CONTROLLERS. See Regulators

CONVERTERS
Worthington Pump & Machinery Corpn., New York 1072-1075

CONVERTERS, ROTARY, ELECTRIC
General Electric Co., Schenectady 508-517
Westinghouse Electric & Mfg. Co., East Pittsburgh 946-961

CONVERTERS, ROTARY, METALLURGICAL
U. S. Cast Iron & Pipe Foundry Co., Burlington, N. J. 916-917

CONVERTERS, SYNCHRONOUS
General Electric Co., Schenectady 508-517
Westinghouse Electric & Mfg. Co., East Pittsburgh 946-961

CONVEYING WEIGHERS. See Scales, Conveyor

CONVEYOR HEADS
Caldwell, H. W., & Son Co., Chicago 381
Jeffrey Manufacturing Co., Columbus, O. 606-607
Jones, W. A., Foundry & Machine Co., Chicago 614-615
Weller Manufacturing Co., Chicago 941

CONVEYOR MAGNETS
Dings Magnetic Separator Co., Milwaukee 438

CONVEYOR SCALES. See Scales, Conveyor

CONVEYORS
American Tool & Machine Co., Boston 282-283
Bartlett Hayward Co., Baltimore 337
Bartlett, C. O., & Snow Co., Cleveland 338
Blaw-Knox Company, Pittsburgh 358-361

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Brown Hoisting Machinery Co., Cleveland 363
Brown Portable Conveying Machinery Co., Chicago 371
Caldwell, H. W., & Son Co., Chicago 381
Corbett, Geo. E., Boiler & Tank Co., Chicago 416
Cresson-Morris Company, Philadelphia 422-423
Cruse-Kemper Company, Ambler, Pa. 425
Dow Company, Louisville 444
Duriron Company, Dayton, O. 450-453
Elwell-Parker Electric Co., Cleveland 465
Fairbanks, Morse & Co., Chicago 473
Gifford-Wood Co., Hudson, N. Y. 522
Guarantee Construction Co., New York 540-541
Haiss, George, Mfg. Co., New York 542-543
Hepworth, S. S., Co., New York 554
Hunt, C. W., Co., Inc., West New Brighton, N. Y. 582-583
Jeffrey Manufacturing Co., Columbus, O. 606-607
Jones, W. A., Foundry & Machine Co., Chicago 614-615
Kilby Manufacturing Co., Cleveland 636
Latimer, Robert L., & Co., Philadelphia 661
Link-Belt Company, Chicago 667
Pennsylvania Crusher Co., Philadelphia 751
Portable Machinery Co., Inc., Passaic, N. J. 775
Raymond Bros. Impact Pulverizer Co., Chicago 792-793
Read Machinery Co., York, Pa. 795
Simpson, Orville, Co., Cincinnati 835
Sprout, Waldron & Co., Muncy, Pa. 848
Standard Carrier Co., New York 850
Standard Conveyor Co., North St. Paul, Minn. 851
Stearns Conveyor Co., Cleveland 855
Sturtevant, B. F., Co., Hyde Park, Boston 869
Sturtevant Mill Company, Boston 870-871
Wagner, J. H., Brooklyn, N. Y. 930
Webster Manufacturing Co., Chicago 940
Weller Manufacturing Co., Chicago 941

CONVEYORS, AIR. See Conveyors, Pneumatic

CONVEYORS, APRON
Bartlett, C. O., & Snow Co., Cleveland 338
Caldwell, H. W., & Son Co., Chicago 381
Dow Company, Louisville 444
Gifford-Wood Co., Hudson, N. Y. 522
Haiss, George, Mfg. Co., New York 542-543
Hunt, C. W., Co., Inc., West New Brighton, N. Y. 582-583
Jeffrey Manufacturing Co., Columbus, O. 606-607
Jones, W. A., Foundry & Machine Co., Chicago 614-615
Latimer, Robert L., & Co., Philadelphia 661
Link-Belt Company, Chicago 667
Stearns Conveyor Co., Cleveland 855
Webster Manufacturing Co., Chicago 940
Weller Manufacturing Co., Chicago 941

CONVEYORS, BAG
Bartlett, C. O., & Snow Co., Cleveland 338
Brown Portable Conveying Machinery Co., Chicago 371
Caldwell, H. W., & Son Co., Chicago 381
Dow Company, Louisville 444
Gifford-Wood Co., Hudson, N. Y. 522
Haiss, George, Mfg. Co., New York 542-543
Hunt, G. W., Co., Inc., West New Brighton, N. Y. 582-583
Jeffrey Manufacturing Co., Columbus, O. 606-607
Jones, W. A., Foundry & Machine Co., Chicago 614-615
Link-Belt Company, Chicago 667
Portable Machinery Co., Inc., Passaic, N. J. 775
Standard Conveyor Co., North St. Paul, Minn. 851
Stearns Conveyor Co., Cleveland 855
Webster Manufacturing Co., Chicago 940
Weller Manufacturing Co., Chicago 941

CONVEYORS, BEET, ROLLER
Kilby Manufacturing Co., Cleveland 636

CONVEYORS, BELT
Bartlett, C. O., & Snow Co., Cleveland 338
Caldwell, H. W., & Son Co., Chicago 381
Dow Company, Louisville 444
Gifford-Wood Co., Hudson, N. Y. 522
Haiss, George, Mfg. Co., New York 542-543

CONVEYORS, BELT—Con. PAGE
Jeffrey Manufacturing Co., Columbus, O. 606-607
Jones, W. A., Foundry & Machine Co., Chicago 614-615
Latimer, Robert L., & Co., Philadelphia 661
Link-Belt Company, Chicago 667
Pennsylvania Crusher Co., Philadelphia 751
Portable Machinery Co., Inc., Passaic, N. J. 775
Read Machinery Co., York, Pa. 795
Sprout, Waldron & Co., Muncy, Pa. 848
Standard Carrier Co., New York 850
Standard Conveyor Co., North St. Paul, Minn. 851
Stearns Conveyor Co., Cleveland 855
Weller Manufacturing Co., Chicago 941

CONVEYORS, BELT, METAL & REVOLVING ACCUMULATING TABLE
Dow Company, Louisville 444

CONVEYORS, BOTTLE
Dow Company, Louisville 444
Gifford-Wood Co., Hudson, N. Y. 522
Jeffrey Manufacturing Co., Columbus, O. 606-607
Link-Belt Company, Chicago 667
Standard Conveyor Co., North St. Paul, Minn. 851
Stearns Conveyor Co., Cleveland 855

CONVEYORS, BUCKET
Bartlett, C. O., & Snow Co., Cleveland 338
Blaw-Knox Company, Pittsburgh 358-361
Corbett, Geo. E., Boiler & Tank Co., Chicago 416
Dow Company, Louisville 444
Gifford-Wood Co., Hudson, N. Y. 522
Haiss, George, Mfg. Co., New York 542-543
Hunt, G. W., Co., Inc., West New Brighton, N. Y. 582-583
Jeffrey Manufacturing Co., Columbus, O. 606-607
Jones, W. A., Foundry & Machine Co., Chicago 614-615
Latimer, Robert L., & Co., Philadelphia 661
Link-Belt Company, Chicago 667
Pennsylvania Crusher Co., Philadelphia 751
Sprout, Waldron & Co., Muncy, Pa. 848
Standard Conveyor Co., North St. Paul, Minn. 851
Stearns Conveyor Co., Cleveland 855
Webster Manufacturing Co., Chicago 940
Weller Manufacturing Co., Chicago 941

CONVEYORS, CHAIN BELT
Dow Company, Louisville 444
Gifford-Wood Co., Hudson, N. Y. 522
Haiss, George, Mfg. Co., New York 542-543
Jeffrey Manufacturing Co., Columbus, O. 606-607
Jones, W. A., Foundry & Machine Co., Chicago 614-615
Standard Carrier Co., New York 850
Stearns Conveyor Co., Cleveland 855
Weller Manufacturing Co., Chicago 941

CONVEYORS, DRAG. See Conveyors, Scraper

CONVEYORS, GRAVITY ROLLER
Dow Company, Louisville 444
Standard Conveyor Co., North St. Paul, Minn. 855

CONVEYORS, HOT COKE
Atlas Car & Mfg. Co., Cleveland 303
Bartlett Hayward Co., Baltimore, Md. 337
Bartlett, C. O., & Snow Co., Cleveland 338
Haiss, George, Mfg. Co., New York 542-543
Hunt, G. W., Co., Inc., West New Brighton, N. Y. 582-583
Isbell-Porter Co., Newark, N. J. 600
Jeffrey Manufacturing Co., Columbus, O. 606-607
Jones, W. A., Foundry & Machine Co., Chicago 614-615
Latimer, Robert L., & Co., Philadelphia 661
Link-Belt Company, Chicago 667
Pennsylvania Crusher Co., Philadelphia 751
Webster Manufacturing Co., Chicago 940
Weller Manufacturing Co., Chicago 941

CONVEYORS, "LEHR"
Stearns Conveyor Co., Cleveland 855

CONVEYORS, LINK-BELT
Bartlett, C. O., & Snow Co., Cleveland 338
Caldwell, H. W., & Son Co., Chicago 381
Dow Company, Louisville 444
Haiss, George, Mfg. Co., New York 542-543
Jeffrey Manufacturing Co., Columbus, O. 606-607
Jones, W. A., Foundry & Machine Co., Chicago 614-615

CONVEYORS, LINK-BELT—Con PAGE
Link-Belt Company, Chicago 667
Morse Chain Company, Ithaca, N Y 712
Read Machinery Co., York, Pa . 795
Standard Conveyor Co., North St. Paul, Minn . . 851
Webster Manufacturing Co., Chicago 940
Weller Manufacturing Co., Chicago 941

CONVEYORS, LIVE ROLLER
Dow Company, Louisville 444

CONVEYORS, OVERHEAD TRACK
Allbright-Nell Co., Chicago. .. 260

CONVEYORS, PAN
Bartlett, C. O., & Snow Co., Cleveland 338
Caldwell, H. W., & Son Co., Chicago 381
Corbett, Geo. E., Boiler & Tank Co., Chicago 416
Dow Company, Louisville . . 444
Gifford-Wood Co., Hudson, N Y 522
Haiss, George, Mfg. Co., New York 542-543
Hunt, C. W., Co., Inc., West New Brighton, N Y . 582-583
Jeffrey Manufacturing Co., Columbus, O . . . 606-607
Jones, W. A., Foundry & Machine Co., Chicago 614-615
Link-Belt Company, Chicago 667
Standard Conveyor Co., North St Paul, Minn. . 851
Stearns Conveyor Co., Cleveland 855
Webster Manufacturing Co., Chicago . .. 940
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CONVEYORS, PNEUMATIC
Buffalo Forge Co., Buffalo .. 373
Guarantee Construction Co., New York 540-541
Roots, P. H. & F. M., Co., Connersville, Ind 811
Standard Carrier Co., New York 850
Sturtevant Mill Company, Boston 870-871
Wagner, J. H., Brooklyn . . . 930

CONVEYORS, PENUMATIC "AIR-VEYOR"
Guarantee Construction Co., New York 540-541

CONVEYORS, PNEUMATIC EQIUPMENT
Roots, P. H. & F. M., Co., Connersville, Ind 811

CONVEYORS, PORTABLE
Blaw-Knox Company, Pittsburgh 358-361
Brown Portable Conveying Machinery Co., Chicago 371
Dow Company, Louisville 444
Haiss, George, Mfg. Co., New York 542-543
Jeffrey Manufacturing Co., Columbus, O. 606-607
Portable Machinery Co., Inc., Passaic, N. J. 775
Stearns Conveyor Co., Cleveland . 855
Webster Manufacturing Co., Chicago . . . 940
Weller Manufacturing Co., Chicago 941

CONVEYORS, PORTABLE, BELT
Haiss, George, Mfg. Co., New York 542-543

CONVEYORS, PORTABLE, "HANDY ANDY"
Dow Company, Louisville 444

CONVEYORS, RIBBON SCROLL. See Conveyors, Screw

CONVEYORS, RINSER CUP
Dow Company, Louisville 444

CONVEYORS, ROLLER SPIRAL
Dow Company, Louisville 444

CONVEYORS, SCOOP
Jones, W. A., Foundry & Machine Co., Chicago 614-615

CONVEYORS, SCRAPER
Bartlett, C. O., & Snow Co., Cleveland 338
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DEVELOPED BLACK 2BN
- **Newport Chemical Works,** Passaic, N J 1164-1165

DEVELOPED BLACK SC
- **Newport Chemical Works, Inc.,** Passaic, N J 1164-1165

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- **Mine and Smelter Supply Co.,** New York . . . 704-705
- **Oliver Continuous Filter Co.,** San Francisco . 736-739
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- **Industrial Filtration Corporation,** New York 586-588
- **Oliver Continuous Filter Co.,** San Francisco 736-739

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- **Chaplain & Bibbo,** New York. 1106
- **Cooper, Chas., & Co.,** New York . 1111
- **Herrick & Voigt,** New York 1129
- **McMeekan, David, Mfg. Co.,** Brooklyn, N Y. . . 1149
- **Powers - Weightman - Rosengarten Co.,** Philadelphia . 1172
- **Wolf, Jacques, & Co.,** Passaic, N J 1212
- Anchor Color & Gum Wks, Dighton, Mass
- Arabol Mfg. Co, New York
- Bayard Products Co, New York
- Bloede, V G., Co., Balt.
- Can Starch Co, Montreal
- Dextro Prod, Inc, Buffalo
- Innis Speiden & Co, New York
- Leyland, Thos, & Co, Readville, Mass.
- Morningstar, Chas., & Co., New York
- Morningstar, Jos., & Co, New York
- National Gum & Mica Co., New York
- Seydel Mfg Co., Jersey City, N. J.
- Whittaker, Clark & Daniels, New York

DEXTRIN, ARROWROOT
- Morningstar, Chas, & Co, New York
- Morningstar, Jos, & Co., New York

DEXTRIN, CASSAVA
- Arabol Mfg Co, New York
- Morningstar, Chas, & Co., New York

DEXTRIN, CORN
- **McMeekan, David, Mfg. Co.,** Brooklyn, N Y 1149
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- Bloede, V G., Co, Balt
- Corn Prod Ref Co, New York
- Morningstar, Chas, & Co, Inc, New York
- Morningstar, Jos, & Co., New York
- Seydel Mfg. Co, Jersey City

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- Arabol Mfg. Co., New York
- Bloede, V. G., Co., Baltimore
- Morningstar, Chas., & Co., New York
- Seydel Mfg. Co., Jersey City
- Suter, Eugene & Co., New York

DEXTRIN, SAGO
- Arabol Mfg Co, New York
- Bloede, V G, Co., Balt.
- Morningstar, Chas, & Co, New York
- Seydel Mfg Co Jersey City

DEXTRIN, TAPIOCA
- **McMeekan, David, Mfg. Co.,** Brooklyn N Y . 1149
- Arabol Mfg Co New York
- Bloede, V G, Co Baltimore
- Morningstar, Chas, & Co, New York
- Morningstar, Jos, & Co., New York
- Seydel Mfg Co, Jersey City

DEXTRIN, WHEAT
- Bloede, V G, Co Balt.
- Morningstar, Chas, & Co, New York

DEXTRIN MACHINERY
- Glacken, Raymond M, Balt.

DEXTROSE
- Corn Prod Ref Co, New York
- Digestive Ferments Co, Detroit
- Special Chem Co, Highland Park, Ill

DIACETYLMORPHINE
- N Y Quinine & Chem Wks., New York

"DIAMALT"
- Amer Diamalt Co, Cincinnati

DIAMID DYESTUFFS
- Chemical Co of Amer, New York

DIAMINE BLUE
- **Metz, H. A., & Co.,** New York . 1154
- Central Dyestuff & Chem Co, Newark, N J

DIAMINE BLUE 3B
- Univ. Aniline Dyes & Chem Co, S Milwaukee, Wis

DIAMINE BORDEAUX
- Althouse Chem. Co, Reading, Pa

DIAMINE GREEN
- **Metz, H. A., & Co.,** New York 1154
- Central Dyestuff & Chem Co, Newark, N J.
- Monroe Drug Co, Quincy, Ill

DIAMINOBENZOL
- Middlesex Aniline Co, New York

DIAMINODIPHENYLMETHANE
- **Heyl Laboratories,** New York 1132
- **Synthetical Laboratories of Chicago,** Chicago 1191

DIAMINOPHENOL
- Brewster & Robbins Co, S River, N J.
- Genl. Supply Co, Perth Amboy, N J.
- Seydel Mfg Co, Jersey City
- Special Materials Co, New York

DIAMINOPHENOL HYDROCHLORIDE
- Marshall, John G, Bklyn
- Stearyte Co, Yonkers, N Y
- Wilbur-White Chem. Co, Owego, N Y

DIAMOND INK
- **Eimer & Amend,** New York . 457
- **Will Corporation,** Rochester, N Y 972-1066

DIANISIDINE
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- **International Oxygen Co.,** Newark, N J 597
- **Manhattan Rubber Mfg. Co.,** Passaic, N J 690
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"DIARSENOL"
- Synthetic Drug Co, Toronto

DIASTASES
- **Malt-Diastase Company,** New York 1151

"DIASTOFOR"
- Amer Diamalt Co., Cincinnati

"DIAX"
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DIAZO BLACK BS PAGE
- **Newport Chemical Works, Inc.,** Passaic, N. J. 1164-1165

DIAZO SEAL BROWN
- Althouse Chem Co., Reading, Pa.

"DIAZOL" DYE ASSISTANT
- Fortner, L. B, Co, Phila.

DIBROMOBENZENE, PARA-
- **Dow Chemical Co.,** Midland, Mich. 1114

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DICHLORAMINE-T
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DICHLOROHYDRIN
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- **Dow Chemical Company,** Midland, Mich 1114

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- Atkins, David J, New York
- Foote Mineral Co, Phila.
- Harrison Mfg Co, Rahway, N. J
- Lindsay Light Co, Chicago

DIDYMIUM OXALATE
- Lindsay Light Co, Chicago

DIDYMIUM OXIDE
- Lindsay Light Co., Chicago

DIDYMIUM SULFATE
- **Synthetical Laboratories of Chicago,** Chicago 1191

DIES, SOAP-MAKERS'
- **Houchin-Aiken Company,** Brooklyn, N Y 578-579
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DIETHYLAMINE
- **Synthetical Laboratories of Chicago,** Chicago 1191
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DIETHYLANILINE
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Eimer & Amend, New York 457
Glass Specialty Co., Newark, N. J 523
Griebel Instrument Co., Inc., Carbondale, Pa 537
Hiergesell Brothers, Philadelphia 560
Kimble Glass Co., Vineland, N J 637
Marshall Rieha, Inc., Baltimore 692
Palo Company, New York 749
Rovey Instrument & Chemical Co., Buffalo 811
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Indus Chem Co, Providence
Read Holliday & Sons, New York
Stanley Aniline Chem Wks, Lock Haven, Pa.
Wetterwald & Pfister, New York
Williamsburg Chem Co, Bklyn.

DIRECT BLACK BH
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DIRECT BLACK EX CONC.
Calco Chem. Co, Bound Brook, N J
United Chem Products Corpn, Jersey City, N J

DIRECT BLACK G
Butterworth - Judson Corpn., New York 1102

DIRECT BLACK 2G
Newport Chemical Works, Inc., Passaic, N J 1164-1165

DIRECT BLACK R
Butterworth - Judson Corpn., New York 1102

DIRECT BLACK RW
Newport Chemical Works, Passaic, N. J 1164-1165

DIRECT BLUE
Heller & Merz Co., New York 1128
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Amer Aniline Prod, New York
Atlantic Dyestuff Co, Boston
Commonwealth Color & Chem Co, Bklyn
Indus Chem Co, Providence
Jacksonville Chem Co, Jacksonville, Fla
Monroe Color & Chem Co, Quincy, Ill
Read Holliday & Sons, New York
Smith, J. R, Color Co, Boston
Stanley Aniline Chem Wks, Lock Haven, Pa
Universal Aniline Dyes & Chem Co., Milwaukee

DIRECT BLUE 2B
Butterworth-Judson Corpn., New York 1102
Calco Chem Co, Bound Brook, N J
Univ Aniline Dyes & Chem Co, Milwaukee

DIRECT BLUE 2B CONC.
Newport Chemical Works, Passaic, N J 1164-1165
Atlantic Dyestuff Co, Boston
Essex Aniline Wks, Boston
United Chem Prod. Corpn, Jersey City

DIRECT BLUE 3B
Atlantic Dyestuff Co, Boston

DIRECT BLUE BG
Newport Chemical Works, Inc., Passaic, N J 1164-1165

DIRECT BLUE 2BO
Metz, H. A., & Co., Inc., New York 1154

DIRECT BLUE 2BX CONC.
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DIRECT BLUE BXG
Newport Chemical Works, Inc., Passaic, N J. 1164-1165

DIRECT BLUE H2G
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DIRECT BORDEAUX, B2S
Althouse Chem. Co., Reading, Pa.

DIRECT BRIGHT FAST BLUE B
Calco Chem Co, Bound Brook, N. J.

DIRECT BRILLIANT BLUE G
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DIRECT BRILLIANT PINK
Althouse Chem. Co., Reading, Pa.

DIRECT BRILLANT ROSE B. EX. CONC. PAGE
Peerless Color Co, Bound Brook, N. J.

DIRECT BRILLIANT VIOLET R
Newport Chemical Works, Inc., Passaic, N J. 1164-1165

DIRECT BRILLIANT YELLOW C
Calco Chem Co, Bound Brook, N J

DIRECT BROWN
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Amer Aniline Prod New York
Indus. Chem Co, Providence
Wetterwald & Pfister, New York

DIRECT BROWN GC CONC.
United Chem Prod Corpn, Jersey City

DIRECT BROWN GR EXTRA
Newport Chemical Works, Inc., Passaic, N J 1164-1165

DIRECT BROWN GX
Indus Chem Co, Providence

DIRECT BROWN GXR
Newport Chemical Works, Inc., Passaic, N J 1164-1165

DIRECT BROWN IN
Calco Chem Co, Bound Brook, N J

DIRECT BROWN M
Butterworth-Judson Corpn., New York 1102

DIRECT BROWN R
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DIRECT BROWN RB
Newport Chemical Works, Inc., Passaic, N J 1164-1165

DIRECT BROWN T
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Calco Chem Co, Bound Brook, N J

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DIRECT FAST BLUE RW
Newport Chemical Works, Inc., Passaic, N J 1164-1165

DIRECT FAST BROWN
Peerless Color Co, Bound Brook, N J.

DIRECT FAST MAROON RED
Calco Chem Co, Bound Brook, N J.
Peerless Color Co, Bound Brook, N J.

DIRECT FAST ORANGE
Althouse Chem Co, Reading, Pa
Peerless Color Co Bound Brook, N J

DIRECT FAST ORANGE G
Calco Chem Co, Bound Brook, N J

DIRECT FAST PINK
Althouse Chem Co, Reading, Pa
Commonwealth Color & Chem Co, Bklyn

DIRECT FAST RED
Peerless Color Co, Bound Brook, N J.

DIRECT FAST RED F
Newport Chemical Works, Inc., Passaic, N J 1164-1165

DIRECT FAST RED R
Indus Chem Co, Providence

DIRECT FAST ROSE
Peerless Color Co, Bound Brook, N J

DIRECT FAST SCARLET
Althouse Chem Co, Reading, Pa
Peerless Color Co, Bound Brook, N J.

DIRECT FAST SCARLET 6BX
Newport Chemical Works, Inc., Passaic, N J 1164-1165

DIRECT FAST VIOLET 4B
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DIRECT FAST YELLOW
Heller & Merz Co., New York 1128
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DIRECT FAST YELLOW NN
Newport Chemical Works, Passaic, N. J 1164-1165

DIRECT GARNET
Althouse Chem. Co., Reading, Pa.

DIRECT GREEN PAGE
Heller & Merz Co., New York 1128
Klipstein, A., & Co., New York 1143
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Amer Aniline Prod, New York
Monroe Color & Chem. Co., Quincy, Ill
Smith, J. R., Color Co., Boston

DIRECT GREEN B
Butterworth-Judson Corpn., New York 1102
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Calco Chem. Co, Bound Brook, N J

DIRECT GREEN BXM
Newport Chemical Works, Inc., Passaic, N J 1164-1165

DIRECT GREEN G
Newport Chemical Works, Inc., Passaic, N J 1164-1165

DIRECT GREEN 2GB
Newport Chemical Works, Inc., Passaic, N J 1164-1165

DIRECT GREEN GXM
◈ **Newport Chemical Works, Inc.,** Passaic, N J 1164-1165

DIRECT GREEN J
Atlantic Dyestuff Co, Boston

DIRECT GREEN Y
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Atlantic Sulfur Yellow GR
Atlantole Acid Black 10B
Atlantole Acid Black 10B Conc.
Atlantole Acid Red AF
Auramine
Autol Red
Azo Yellow
Azoeosine G
Azofuchsine
Azorubine
Azoline Red
Basic Black
Basic Blue
Basic Blue, Bright
Basic Brown
Basic Orange
Basic Purple
Benzoazurine G Extra
Benzo Blue
Benzopurpurine 4B
Benzopurpurine 10B
Biebrich Acid Blue DS
Bismarck Brown R
Bismarck Brown Y
Bordeaux
Bordeaux B
Brazil Brown
Brilliant Crimson No. 10
Brilliant Green
Brilliant New Cotton Yellow L Conc.
Brilliant Orange
Brilliant Red
Brilliant Scarlet
Brilliant Scarlet 3R
Brilliant Sulfur Blue
Brilliant Yellow
Bromo Fluorescein
Broom Green
Burmah Red
Carmoisine
Centraline Black BH
Centraline Blue 2B
Centraline Blue 3B
Centraline Fast Red F
Centraline Violet N
Chrome Black
Chrome Black A
Chrome Black FF
Chrome Blue
Chrome Blue G Extra
Chrome Blue-Black
Chrome Blue-Black V
Chrome Blue-Black V Conc.
Chrome Bordeaux
Chrome Brown
Chrome Brown 3G
Chrome Fast Brown W
Chrome Fast Orange A
Chrome Fast Red B
Chrome Fast Yellow P
Chrome Gray
Chrome Green
Chrome Green C
Chrome Green CC
Chrome Green G
Chrome Green GN
Chrome Green N
Chrome Orange GG
Chrome Orange R
Chrome Phosphine SW
Chrome Red
Chrome Red A4B
Chrome Scarlet
Chrome Violet
Chrome Yellow
Chrome Yellow G
Chrome Yellow 3G
Chrome Yellow 5G
Chrome Yellow 2R
Chrysamine
Chrysamine G
Chrysoidine
Chrysoine
Chrysophenine
Chrysophenine Extra
Chrysophenine Extra, Triple Strength
Claret Red R
Coeruline
Congo Blue
Congo Corinth
Congo Red
Congo Red 4B
Coralline Red
Cosmic Black
Cotton Blue 2B
Croceine Orange R

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Croceine Scarlet
Crystal Violet
Crystal Violet 6B
Delphine Blue
Developed Black
Developed Black BH
Developed Black 2BN
Developed Black SC
Diamine Blue
Diamine Blue 3B
Diamine Bordeaux
Diamine Green
Diazo Black RS
Diazo Seal Brown
Direct Black
Direct Black BH
Direct Black Ex. Conc.
Direct Black 2E Extra Conc.
Direct Black G
Direct Black 2G
Direct Black R
Direct Black RW
Direct Blue
Direct Blue 2B
Direct Blue 2B Conc.
Direct Blue 3B
Direct Blue 2BO
Direct Blue BX
Direct Blue 2BX Conc.
Direct Blue BXG
Direct Blue H2G
Direct Bordeaux B2S
Direct Bright Fast Blue B
Direct Brilliant Blue G
Direct Brilliant Pink
Direct Brilliant Rose B Extra Conc.
Direct Brilliant Violet R.
Direct Brilliant Yellow C
Direct Brown
Direct Brown GC Conc.
Direct Brown GR Extra
Direct Brown GX
Direct Brown GXR
Direct Brown IN
Direct Brown M
Direct Brown RB
Direct Brown T
Direct Dark Brown
Direct Dark Green C
Direct Fast Blue RW
Direct Fast Brown
Direct Fast Maroon Red
Direct Fast Orange
Direct Fast Orange G
Direct Fast Pink
Direct Fast Red
Direct Fast Red F
Direct Fast Red R
Direct Fast Rose
Direct Fast Scarlet
Direct Fast Scarlet 6BX
Direct Fast Violet 4B
Direct Fast Yellow
Direct Fast Yellow NN
Direct Garnet
Direct Gray
Direct Green
Direct Green B
Direct Green BXM
Direct Green G
Direct Green 2GB
Direct Green GXM
Direct Green J
Direct Green Y
Direct Green 2Y
Direct Heliotrope B
Direct Khaki
Direct Maroon
Direct Navy Blue
Direct Neutral Gray
Direct Orange
Direct Orange 3G
Direct Orange R
Direct Orange 2R
Direct Orange 2RG
Direct Pink 2B
Direct Red
Direct Red F
Direct Red Y
Direct Rose
Direct Salmon B
Direct Salmon Red
Direct Scarlet
Direct Seal Brown
Direct Sky Blue
Direct Sky Blue 6B
Direct Sky Blue FF
Direct Steel Blue G
Direct Violet
Direct Violet N
Direct Violet R
Direct Yellow
Direct Yellow CJ
Direct Yellow DG
Direct Yellow G
Direct Yellow GX
Direct Yellow R
Direct Yellow SW
Egg Color
Empire Acid Black
Empire Acid Bordeaux
Empire Acid Maroon

DYESTUFFS—Con.
Empire Acid Orange
Empire Acid Red
Empire Acid Scarlet
Empire Acid Violet 4BN
Empire Acid Violet 620
Empire Brilliant Green
Empire Brilliant Yellow
Empire Dark Blue
Empire Dark Green
Empire Fast Red
Eosine
Eosine Red
Erie Black
Erie Brown
Erie Orange 2R
Erythrine
Erythrosine
Essex Chrome Green B Conc.
Essex Chrysophenine
Essex Direct Brilliant Pink SX
Essex Direct Brown D3G
Essex Direct Brown R
Essex Direct Brown 2R
Essex Direct Brown RN
Essex Direct Brown Y
Essex Direct Brown 2Y
◈ Essex Direct Fast Scarlet B
Essex Direct Orange R
Essex Direct Orange 2RE
Essex Direct Orange 3RE
Essex Direct Orange 4RE
Essex Direct Orange 5RE
Essex Direct Pink NY
Essex Direct Pink 2Y
Essex Direct Rose NB
Essex Direct Rose FFB
Essex Direct Yellow CF
Essex Direct Yellow 2G
Essex Teramine GB
Fast Acid Blue GG
Fast Acid Orange 2G
Fast Acid Red C2B
Fast Acid Violet 10B
Fast Black V
Fast Black VC
Fast Blue
Fast Brown G
Fast Crimson
Fast Egyptian
Fast Gray
Fast Green
Fast Leather Brown BR
Fast Leather Red L3
Fast Leather Yellow LF
Fast Light Yellow 3G
Fast Pigment Black
Fast Ponceau Orange
Fast Red
Fast Red A
Fast Red 6B Extra
Fast Red 8B Extra
Fast Red SBT
Fast Red T Extra
Fast Silk Gray M
Fast Steam Black
Fast Steam Gray
Fast Violet
Fast Yellow
Flaming Red B
Flaming Red 5B
Flaming Red 10B
Fuchsine
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Fur Black
Fur Blue
Fur Brown
Gallocyanine
Gendarme Blue
Gobelin Blue
Graphic Red Y & R
Indigotine A
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Indigotine C
Indophenine Blue
Induline Blue
Induline Oil Sol.
Induline Spirit Sol.
Induline Water Sol.
Lake Red C
Lanacyl Violet M
Lanafuchsine
Lanafuchsine B
London Blue
Magenta B
Malachite Green
Maracaibo Brown
Marine Blue SW
Meldola Blue 3R
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Methyl Violet
Methyl Violet 2B
Methyl Violet 3B
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Methyl Violet 5B Conc.
Methyl Violet 4BN
Methylene Blue
Methylene Blue 2B
Methylene Blue 4B
Methylene Gray
Methylene Gray B
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Methylene Green
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Mordant Green 2G
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Naphthol Blue
Naphthol Blue B
Naphthol Blue R
Naphthol Green
Naphthol Yellow
Naphthol Yellow S
Naphthylamine Red
Navy Blue G
Navy Blue R
Navy Blue for Wool
Neutral Gray G
New Brilliant Cotton Yellow L Conc.
Nigrosine Blue Oil Sol.
Nigrosine Blue Spirit Sol.
Nigrosine Blue Water Sol.
Nigrosine Jet Oil Sol.
Nigrosine Jet Spirit Sol.
Nigrosine Jet Water Sol.
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Oil Black Walnut
Oil Blue
Oil Blue B
Oil Brown
Oil Cherry
Oil Green
Oil Mahogany Red
Oil Orange
Oil Orange Extra
Oil Pink
Oil Red
Oil Scarlet
Oil Violet
Oil Walnut
Oil Yellow
Opal Blue
Orange A
Orange GG
Orange GGR
Orange I
Orange II
Orange Y
Ortho-Cyanine B
Ortho-Cyanine R
Oxamine Violet Blue
Pacco Direct Brown C
Pacco Direct Brown M
Pacco Direct Fast Red F
Pacco Direct Green
Pacco Direct Gray
Palachrome Blue G
Palachrome Green G
Palaside Black
Palaside Blue G
Palaside Blue R
Palaside Brown B
Palaside Green
Patent Blue
Patent Blue A
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Permanent Red 4B
Permanent Red R
Pheno Black
Pheno Blue
Pheno Brown
Pheno Green
Pheno Orange
Pheno Violet
Pheno Yellow
Phloxine
Pigment Scarlet 3B
Plum GC
Ponceau 2G
Ponceau 5R
Ponceau Scarlet
Potting Black CC
Primazol Rose
Primuline
Primuline Extra Conc.
Primuline SF (Developed)
Primuline Superior (Developed)
Pyrazol Orange G
Quinoline Yellow
Rajah Red
Raspberry Red
Resorcin Brown
Rhodamine
Rhodamine B Extra
Rhodamine 6G Extra
Rocceline
Rodol A
Rodol D
Rodol DB
Rodol DG
Rodol 2G
Rodol 4G
Rodol SA
Rodol X
Rodol Gray B
Rodol Gray CD
Rodol Gray R
Rose Bengal
Safranine
Safranine Y
Sap Brown
Scarlet 2R
Scarlet 2RG
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Scarlet 3R
Serichrome Blue R
Serichrome Green B
Soluble Blue (Coal-tar Color)
Soluble Blue for Ink
Soluble Blue 2B
Soluble Blue E
Soluble Blue 2R
Soluble Blue 2G
Spirit Blue
Steam Black
Steam Blue
Sudan I
Sulfur Black
Sulfur Black A
Sulfur Blue
Sulfur Blue 3B
Sulfur Blue BCX Conc
Sulfur Blue BCG Conc.
Sulfur Blue BCR Ex. Conc.
Sulfur Blue 4BX Conc.
Sulfur Blue RX
Sulfur Blue RBXG
Sulfur Brown
Sulfur Brown C3R
Sulfur Brown 2F
Sulfur Brown X
Sulfur Brown R
Sulfur Cutch R
Sulfur Drab, Hydro V
Sulfur Fast Yellow G
Sulfur Green
Sulfur Green Conc.
Sulfur Green BCG
Sulfur Green DGB
Sulfur Green G
Sulfur Green G Conc.
Sulfur Indigo Blue B
Sulfur Indone 3B
Sulfur Indone 2R
Sulfur Khaki
Sulfur Maroon R
Sulfur Navy Blue
Sulfur Olive
Sulfur Olive O
Sulfur Olive OD
Sulfur Orange Brown
Sulfur Sky Blue
Sulfur Tan Conc.
Sulfur Yellow
Sulfur Yellow R
Sultan Red
Table Black
Tangier Orange
Tartrazine
Tartrazine RX
Tartrazine XXX
Tokio Orange
Toluylene Brown
Union Blue FB
Union Blue FR
Union Yellow FFF
Uranine
Victoria Blue B
Victoria Green
Victoria Red
Victoria Scarlet 3R
Victoria Violet
Victoria Violet 4BS
Violamine B
Violamine R
Violamine RB
Wash Blue
Wool Black
Wool Black B
Wool Black G Conc.
Wool Blue GX
Wool Claret
Wool Fast Green BS
Wool Fast Violet 4B Extra
Wool Green S
Wool Green S Conc.
Wool Orange
Wool Scarlet 2R
Wool Violet RS
Wright's Brilliant Sulfur Blue B
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Agawam Chem. Wks., Providence

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Althouse Chem. Co., Reading, Pa.
Amalgamated Dyestuff & Chem. Wks, New York
Amer Aniline Prod., New York
Amer Synthetic Color Co., Stamford, Conn.
Amer Synthetic Dyes, Newark, N J
Atlantic Dyestuff Co, Boston, Mass
Atlas Color Wks, Bklyn
Bachmeier & Co, New York
Beaver Chem Co, Damascus, Va.
Calif Ink Co W Berkeley, Calif
Campbell, John & Co, New York, N Y
Central Dyestuff & Chem Co, Newark, N J
Chem Prod Corpn, Milwaukee
Chrome Color Wks, Matawan, N J
Colloform Chem Co, Dundee Lake, N J
Color Service Corpn, New York
Commonwealth Color & Chem Co, Bklyn
Conn Metal & Chem Co, Berlin, Ct
Cooks Falls Dye Wks, Cooks Falls, N Y
Cosmos Chem Co, Plainfield, N J
Dye Prod. & Chem Co, New York
Essex Aniline Wks, Boston
Fergusson, Alex C, Jr, Phila
Garfield Aniline Wks, Garfield, N J
Genl Supply Co, Perth Amboy, N J.
Heald, Jno H, & Co, Inc, Lynchburg, Va
Heath Mfg Co, St Louis
Holland Aniline Co, Holland, Mich
Holliday Kemp Co, New York
Hub Dyestuff & Chem Co, Boston
Hydrocarbon Chem Prod Co, Lancaster, Pa
Indus Chem Co, Providence
Kenatt Synth Prod Co, Chicago
King Chem Co, New York
Long & Co, W H, New York
May Chemical Works, Newark, N J
Miller, Wm T, Aniline & Chem Co, Bklyn
Mineral Dye Prod, Trenton
Monroe Color & Chem Co, Quincy, Ill
N Y Color & Chem Co, New York
Noll Chem & Color Wks, New York
Oakes Mfg Co, Long Island City, N Y
Obex Co, Marietta, Ohio
Organic Prod Corpn, Schenectady
Palatine Aniline & Chem Corpn., Boston
Peerless Color Co, Bound Brook, N J
Pharma Chem Corpn, New York
Radiant Dye & Color Wks, Bklyn.
Reliance Aniline & Chem Co., New York
Rowayton Aniline Wks, Rowayton, Conn
Schaper Chem Co, Chicago
Seydel Mfg Co, Jersey City
Sherwin-Williams Co, Cleveland
Staler Chem Co, New York
Stamford Extract Mfg Co, Stamford, Conn
Stanley Aniline Chem Wks, Lock Haven, Pa
Sterling Color Co, New York
Taylor-White Extracting Co, Camden, N J
Trico Chem Co, Buffalo
Ultro Chem Corpn, New York
United Chem Prod. Corpn., Jersey City
United Indigo & Chem. Co, Boston
U. S Color & Chemical Co, Boston
Univ Aniline Dyes & Chem Co, Milwaukee
Wetterwald & Pfister, New York
White Tar Aniline Corpn, New York
Widder Bros, Bklyn
Williamsburg Chem Co, Bklyn.
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- **Will Corporation,** Rochester, N. Y. 972-1066

DYESTUFFS, INDICATOR
- **Alizarin**
- **Alpha-Naphtholbenzene**
- **Alpha-Naphthylamine**
- **Azolitmin**
- **Benzopurpurine**
- **Brilliant Green**
- **Bromocresol Purple**
- **Bromophenol Blue**
- **Bromothymol Blue**
- **Carmine**
- **Carminic Acid**
- **Congo Red**
- **Coralline**
- **Cresol Blue**
- **Cresolphthalein**
- **Cresol Red**
- **Crystal Violet**
- **Dibromocresolsulfonephthalein**
- **Dimethylaminoazobenzene**
- **Dimethylaminoazobenzaldehyde**
- **Dimethylglyoxime**
- **Diphenylamine**
- **Diphenylaminazobenzene**
- **Eosine**
- **Ethyl Orange**
- **Fluorescein**
- **Fuchsine, Acid**
- **Fuchsine, Basic**
- **Indigotine**
- **Iodoeosine**
- **Meta-Dinitrobenzoylene Urea**
- **Methyl Orange**
- **Methyl Red**
- **Methyl Violet**
- **Methylene Blue**
- **Neutral Red**
- **Ortho-Carboxybenzeneazodimethylaniline**
- **Ortho-Cresolsulfonephthalein**
- **Para-Nitrophenol**
- **Phenacetolin**
- **Phenol Red**
- **Phenolphthalein**
- **Phenolsulfonephthalein**
- **Phenylhydrazine**
- **Phenylhydrazine Hydrochloride**
- **Porrier's Blue**
- **Resorcinol Blue**
- **Rosolic Acid**
- **Tetrabromophenolsulfonephthalein**
- **Thymol Blue, Acid**
- **Thymol Blue, Alkaline**
- **Thymolphthalein**
- **Thymolsulfonephthalein, Acid**
- **Thymolsulfonephthalein, Alkaline**
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- **Heyl Laboratories,** New York 1132

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- **Du Pont de Nemours, E. I., & Co.,** Wilmington 1116-1118

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- **Sherwood Manufacturing Co.,** Buffalo 831

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- **Ott, George F., Co.,** Philadelphia 741
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- Carbondale Mach. Co, Carbondale, Pa.
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- **Duriron Company,** Dayton, O 450-453
- **Eynon-Evans Corpn.,** Philadelphia 472
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- **Sherwood Manufacturing Co.,** Buffalo 831
- **Watson & McDaniel Co.,** Philadelphia 938
- Chaplin-Fulton Mfg. Co, Pittsburgh
- Cornell, W G, Co, New York
- Nason Mfg. Co., New York
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EJECTORS, ACID
- **Acid Proof Clay Products Co.,** Akron, O. 248
- **Duriron Company,** Dayton, O . .450-453
- **General Ceramics Co.,** New York 504-507
- **Knight, Maurice A.,** East Akron, O 638-649
- **Schutte & Koerting Co.,** Philadelphia 822-823
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ELASTIC PAPER LININGS FOR BARRELS, ETC.
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- **Westinghouse Electric & Mfg. Co.,** East Pittsburgh, Pa 946-961
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- **General Electric Company,** Schenectady 508-517
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- Republic Carbon Co, Niagara Falls
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Milling Blue 2B
Milling Yellow FC
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Naphthol B. Black
Naphthol Blue
Naphthol Blue B
Naphthol Blue R
Naphthol Green
Naphthol Yellow
Naphthol Yellow S
Naphthylamine Red
Navy Blue G
Navy Blue R
Navy Blue for Wool
Neutral Gray G
New Brilliant Cotton Yellow L Conc.
Nigrosine Blue Oil Sol.
Nigrosine Blue Spirit Sol.
Nigrosine Blue Water Sol.
Nigrosine Jet Oil Sol.
Nigrosine Jet Spirit Sol.
Nigrosine Jet Water Sol.
Oil Black
Oil Black Walnut
Oil Blue
Oil Blue B
Oil Brown
Oil Cherry
Oil Green
Oil Mahogany Red
Oil Orange
Oil Orange Extra
Oil Pink
Oil Red
Oil Scarlet
Oil Violet
Oil Walnut
Oil Yellow
Opal Blue
Orange A
Orange GG
Orange GGR
Orange I
Orange II
Orange Y
Ortho-Cyanine B
Ortho-Cyanine R
Oxamine Violet Blue
Pacco Direct Brown C
Pacco Direct Brown M
Pacco Direct Fast Red F
Pacco Direct Green
Pacco Direct Gray
Palachrome Blue G
Palachrome Green G
Palaside Black
Palaside Blue G
Palaside Blue R
Palaside Brown B
Palaside Green
Patent Blue
Patent Blue A
Patent Blue V
Permanent Red 4B
Permanent Red R
Pheno Black
Pheno Blue
Pheno Brown
Pheno Green
Pheno Orange
Pheno Violet
Pheno Yellow
Phloxine
Pigment Scarlet 3B
Plum GC
Ponceau 2G
Ponceau 5R
Ponceau Scarlet
Potting Black CC
Primazol Rose
Primuline
Primuline Extra Conc.
Primuline SF (Developed)
Primuline Superior (Developed)
Pyrazol Orange G
Quinoline Yellow
Rajah Red
Raspberry Red
Resorcin Brown
Rhodamine
Rhodamine B Extra
Rhodamine 6G Extra
Rocceline
Rodol A
Rodol D
Rodol DB
Rodol DG
Rodol 2G
Rodol 4G
Rodol SA
Rodol X
Rodol Gray B
Rodol Gray CD
Rodol Gray R
Rose Bengal
Safranine
Safranine Y
Sap Brown
Scarlet 2R
Scarlet 2RG
Scarlet 2RR

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Scarlet 3R
Serichrome Blue R
Serichrome Green B
Soluble Blue (Coal-tar Color)
Soluble Blue for Ink
Soluble Blue 2B
Soluble Blue E
Soluble Blue 2R
Soluble Blue 2G
Spirit Blue
Steam Black
Steam Blue
Sudan I
Sulfur Black
Sulfur Black A
Sulfur Blue
Sulfur Blue 3B
Sulfur Blue BCX Conc
Sulfur Blue BCG Conc.
Sulfur Blue BCR Ex. Conc.
Sulfur Blue 4BX Conc.
Sulfur Blue RX
Sulfur Blue RBXG
Sulfur Brown
Sulfur Brown C3R
Sulfur Brown 2F
Sulfur Brown X
Sulfur Brown R
Sulfur Cutch R
Sulfur Drab, Hydro V
Sulfur Fast Yellow G
Sulfur Green
Sulfur Green Conc.
Sulfur Green BCG
Sulfur Green DGB
Sulfur Green G
Sulfur Green G Conc.
Sulfur Indigo Blue B
Sulfur Indone 3B
Sulfur Indone 2R
Sulfur Khaki
Sulfur Maroon R
Sulfur Navy Blue
Sulfur Olive
Sulfur Olive O
Sulfur Olive OD
Sulfur Orange Brown
Sulfur Sky Blue
Sulfur Tan Conc.
Sulfur Yellow
Sulfur Yellow R
Sultan Red
Table Black
Tangier Orange
Tartrazine
Tartrazine RX
Tartrazine XXX
Tokio Orange
Toluylene Brown
Union Blue FB
Union Blue FR
Union Yellow FFF
Uranine
Victoria Blue B
Victoria Green
Victoria Red
Victoria Scarlet 3R
Victoria Violet
Victoria Violet 4BS
Violamine B
Violamine R
Violamine RB
Wash Blue
Wool Black
Wool Black B
Wool Black G Conc.
Wool Blue GX
Wool Claret
Wool Fast Green BS
Wool Fast Violet 4B Extra
Wool Green S
Wool Green S Conc.
Wool Orange
Wool Scarlet 2R
Wool Violet RS
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American Dyewood Co., New York	1090
Butterworth - Judson Corpn., New York	1102
Chaplain & Bibbo, New York . .	1106
Dow Chemical Co., Midland, Mich.	1114
Du Pont de Nemours, E. I., & Co., Wilmington, Del . . .	1116-1118
Gaskill Chemical Corpn., Brooklyn N Y	1123
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Heller & Merz Co., New York . . .	1128
Herrick & Voigt, New York . . .	1129
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Tower Manufacturing Co., Inc., New York	1196
Wolf, Jacques, & Company, Passaic, N. J	1212
Zinsser & Co., Hastings, N Y . . .	1213

Agawam Chem. Wks., Providence

DYESTUFFS—Con.
Althouse Chem. Co., Reading, Pa.
Amalgamated Dyestuff & Chem. Wks, New York
Amer Aniline Prod., New York
Amer Synthetic Color Co., Stamford, Conn.
Amer Synthetic Dyes, Newark, N J
Atlantic Dyestuff Co, Boston, Mass
Atlas Color Wks, Bklyn
Bachmeier & Co, New York
Beaver Chem Co, Damascus, Va.
Calif Ink Co W Berkeley, Calif
Campbell, John & Co, New York, N Y
Central Dyestuff & Chem Co, Newark, N J
Chem Prod Corpn, Milwaukee
Chrome Color Wks, Matawan, N J
Colloform Chem Co, Dundee Lake, N J
Color Service Corpn, New York
Commonwealth Color & Chem Co, Bklyn
Conn Metal & Chem Co, Berlin, Ct
Cooks Falls Dye Wks, Cooks Falls, N Y
Cosmos Chem Co, Plainfield, N J
Dye Prod. & Chem Co, New York
Essex Aniline Wks, Boston
Fergusson, Alex C, Jr, Phila
Garfield Aniline Wks, Garfield, N J
Genl Supply Co, Perth Amboy, N J.
Heald, Jno H, & Co, Inc, Lynchburg, Va
Heath Mfg Co, St Louis
Holland Aniline Co, Holland, Mich
Holliday Kemp Co, New York
Hub Dyestuff & Chem Co, Boston
Hydrocarbon Chem Prod Co, Lancaster, Pa
Indus Chem Co, Providence
Kenatt Synth Prod Co, Chicago
King Chem Co, New York
Long & Co, W H, New York
May Chemical Works, Newark, N J
Miller, Wm T, Aniline & Chem Co, Bklyn
Mineral Dye Prod, Trenton
Monroe Color & Chem Co, Quincy, Ill
N Y Color & Chem Co, New York
Noil Chem & Color Wks, New York
Oakes Mfg Co, Long Island City, N Y
Obex Co, Marietta, Ohio
Organic Prod Corpn, Schenectady
Palatine Aniline & Chem Corpn., Boston
Peerless Color Co, Bound Brook, N J
Pharma Chem Corpn, New York
Radiant Dye & Color Wks, Bklyn.
Reliance Aniline & Chem Co., New York
Rowayton Aniline Wks, Rowayton, Conn
Schapper Chem Co, Chicago
Seydel Mfg Co, Jersey City
Sherwin-Williams Co, Cleveland
Staler Chem Co, New York
Stamford Extract Mfg Co, Stamford, Conn
Stanley Aniline Chem Wks, Lock Haven, Pa
Sterling Color Co, New York
Taylor - White Extracting Co, Camden, N J
Trico Chem Co, Buffalo
Ultro Chem Corpn, New York
United Chem Prod. Corpn., Jersey City
United Indigo & Chem. Co, Boston
U. S Color & Chemical Co, Boston
Univ Aniline Dyes & Chem Co, Milwaukee
Wetterwald & Pfister, New York
White Tar Aniline Corpn, New York
Widder Bros, Bklyn
Williamsburg Chem Co, Bklyn.
Wright Chem Corpn, New York
Young, J S, & Co, Hanover, Pa.
Zobel Co, Ernest, New York

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Audubon Wire Cloth Co., Audubon, N. J	806
Estey Wire Works Co., New York	470-471
Metal Fabrics Co., New York	700-701

ENGINEERING CONTRACTORS

Many of the firms in the following list specialize in some one line: others handle all kinds of engineering contracts. Time will be saved in all cases by consulting the pages on which these firms outline the nature of their services

American Lead Burning Corpn., New York	271
Badger, E. B., & Sons Co., Boston	310-329
Bleach Process Company, Appleton, Wis.	357
Buffalo Foundry & Machine Co., Buffalo	374-379
Cannon-Swenson Co., Chicago	384-385
Carrier Engineering Corpn., Newark, N J	386
Chemical Equipment Co., Chicago	394-395
Cresson-Morris Company, Philadelphia	422-423
Cruse-Kemper Company, Ambler, Pa.	425
Distillation Industries, New York	491
Drying Systems, Inc., Chicago	448-449
Fleisher, W. L., & Co., Inc., New York	480-481
Garrigue, William, & Company, Chicago and New York	496-501
Glander & Company, Newark, N J	524-525
Guarantee Construction Co., New York	540-541
Hercules Engineering Corpn., New York	556-559
Hope Engineering & Supply Co., Mt. Vernon, O.	572
International Oxygen Co., Newark, N. J.	597
Isbell-Porter Co., Newark, N. J	600
Jeffrey Manufacturing Co., Columbus, O.	606-607
K-B Pulverizer Co., Inc., New York	617
Lasker Iron Works, Chicago	660
Lewis Recovery Co., Boston	665
Link-Belt Company, Chicago	667
Love Brothers, Inc., Aurora, Ill.	671
Malcolmson Engineering & Machinery Corpn., Chicago	687
Mantius Engineering Co., Inc., New York	688-689
Meade, Richard K., & Co., Baltimore	696
Oakland Copper & Brass Works, Oakland, Cal	732-733
Parks-Cramer Company, Fitchburg, Mass.	750
Ruggles - Coles Engineering Co., New York	818
Surface Combustion Co., New York	874-875
Thatcher, John, & Son, Brooklyn, N. Y	885
U. S. & Cuban Allied Works Engineering Corpn., New York	920
Wagner, J. H., Brooklyn, N. Y.	930

ENGINEERS, BRIQUETTING

Malcolmson Engineering & Machinery Corpn., Chicago	687

ENGINEERS, CEMENT

Hardinge Company, New York	544-545
Meade, Richard K., & Co., Baltimore	696
Smidth, F. L., & Co., New York	

ENGINEERS, CHEMICAL

This does not purport to be a complete list of chemical engineers It is a list of firms using space in the book which have chemical engineering services to offer

Acme Coppersmithing Co., Chicago	249
Allbright-Nell Co., Chicago	260
Badger, E. B., & Sons Co., Boston	310-329
Bleach Process Company, Appleton, Wis	357
Buffalo Foundry & Machine Co., Buffalo	374-379
Chemical Equipment Co., Chicago	394-395
Cruse-Kemper Company, Ambler, Pa.	425
Distillation Industries, New York.	491
Duriron Company, Dayton, O.	450-453
Electro-Chemical Supply & Engineering Co., Philadelphia	460
Fairlie, Andrew M., Atlanta, Ga.	474
Garrigue, William, & Company, Chicago and New York	496-501
General Ceramics Company, New York	504-507
General Machine Company, Newark N. J.	518-519
Glander & Company Newark, N J	524-525
Hercules Engineering Corporation, New York	556-559
Lasker Iron Works, Chicago	660

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Lewis Recovery Co., Boston	665
Little, Arthur D., Inc., Cambridge, Mass.	668
Mantius Engineering Co., Inc., New York	688-689
Meade, Richard K., & Co., Baltimore	696
Meigs, Bassett & Slaughter, Inc., Philadelphia	697
Oakland Copper & Brass Works, Oakland, Cal.	732-733
Perry & Webster, Inc., New York	760-761
U. S. & Cuban Allied Works Engineering Corpn., New York	920
Zaremba Company, Buffalo	1081-1084

ENGINEERS, CHEMICAL, CONSTRUCTION

This does not purport to be a complete list of chemical engineers. It is a list of firms using space in the book which have chemical engineering services to offer

Allbright-Nell Co., Chicago	260
American Lead Burning Corpn., New York	271
Badger, E. B., & Sons Co., Boston	310-329
Bethlehem Foundry & Machine Co., South Bethlehem, Pa.	353
Bleach Process Company, Appleton, Wis.	357
Buffalo Foundry & Machine Co., Buffalo	374-379
Cannon-Swenson Co., Chicago	384-385
Chemical Equipment Co., Chicago	394-395
Cresson-Morris Company, Philadelphia	422-423
Cruse-Kemper Company, Ambler, Pa.	425
Distillation Industries, New York	491
Electrochemical Supply & Engineering Co., Philadelphia	460
Fairlie, Andrew, M., Atlanta, Ga.	474
Garrigue, William, & Company, Chicago and New York	496-501
General Ceramics Company, New York	504-507
General Machine Company, Newark, N J	518-519
Glander & Company, Newark, N. J	524-525
Guarantee Construction Co., New York	540-541
Hardinge Company, New York	544-545
Hercules Engineering Corpn., New York	556-559
International Oxygen Co., Newark, N J.	597
Jacoby, Henry E., New York	603
Lasker Iron Works, Chicago	660
Lewis, Green, McAdams & Knowland	664
Lewis Recovery Corporation, Boston	665
Little, Arthur D., Inc., Cambridge, Mass	668
Love Brothers, Inc., Aurora, Ill	671
Lummus, Walter E., Co., Boston	674-681
Mantius Engineering Co., Inc., New York	688-689
Meade, Richard K., & Co., Baltimore	696
Meigs, Bassett & Slaughter, Inc., Philadelphia	697
Oakland Copper & Brass Works, Oakland, Cal	732-733
Perry & Webster, Inc., New York	760-761
Scott, Ernest, & Co., Fall River, Mass	828
Sperry, D. R., & Co., Batavia, Ill	844-846
U. S. & Cuban Allied Works Engineering Corpn., New York	920
Zaremba Company, Buffalo	1081-1084

ENGINEERS, COMBUSTION

Anthony Co., Long Island City, N. Y.	292
K-B Pulverizer Co., New York	617
Malcolmson Engineering & Machinery Corpn., Chicago	687
Meade, Richard K., & Co., Baltimore	696
Surface Combustion Co., New York	874-875
Uehling Instrument Co., New York	904
White Fuel Oil Eng. Corpn., New York	965

ENGINEERS, COALING

Fuller-Lehigh Company, Fullerton, Pa	492-493
Meade, Richard K., & Co., Baltimore	696

ENGINEERS, CONVEYING

Weller Manufacturing Co., Chicago	941

ENGINEERS, DRYING

Carrier Engineering Corpn., Newark, N. J	386
Lewis, Green, McAdams & Knowland, Boston	664
Malcolmson Engineering & Machinery Corpn., Chicago	687
Ruggles - Coles Engineering Co., New York	818
Wagner, J. H., Brooklyn, N. Y.	930

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Chemical Equipment Co., Chicago	394-395
Kestner Evaporator Co., Philadelphia	632-633
Mantius Engineering Co., New York	688-689
Swenson Evaporator Co., Chicago	876-881

ENGINEERS, FILTRATION

Filtration Engineers, Inc., New York	478
Independent Filter Press Co., Brooklyn, N Y	585

ENGINEERS, FLOUR AND FEED MILL

Robinson Mfg. Co., Muncy, Pa.	809
Sprout, Waldron, & Co., Muncy, Pa.	848

ENGINEERS, HYDRAULIC

Carver, Fred S., New York	387

ENGINEERS, METALLURGICAL

Dorr Company, New York	440-441
Lewis, Green, McAdams & Knowland, Boston	664
Little, Arthur D., Inc., Boston	668
Meigs, Bassett & Slaughter, Inc., Philadelphia	697
Mantius Engineering Co., New York	688-689
Perry & Webster, Inc., New York	760-761

ENGINEERS, PETROLEUM AND NATURAL GAS

Hope Engineering & Supply Co., Mt. Vernon, O.	572

ENGINEERS, PIPING

American Foundry & Cons. Co., Pittsburgh	266-267
Blaw-Knox Company, Pittsburgh	358-361
Dougherty, M. J., Co., Philadelphia	442-443
Grinnell Company, Inc., Providence	532-536
Hope Engineering & Supply Co., Mt. Vernon, O.	572
Michigan Pipe Company, Bay City	702
Parks-Cramer Company, Fitchburg, Mass	750
Pittsburgh Valve, Foundry & Construction Co., Pittsburgh	766-768
Power Piping Company, Pittsburgh	776-777
Whitlock Coil Pipe Co., Hartford, Conn.	966-967

ENGINEERS, PULP AND PAPER MILL

Cannon-Swenson Co., Chicago	384-385
Glens Falls Machine Works, Glens Falls, N. Y.	526
Lewis, Green, McAdams & Knowland, Boston	664
Little, Arthur D., Inc., Boston	668
Mantius Engineering Co., New York	688-689
Meade, Richard K., & Co., Baltimore	696
Meigs, Bassett & Slaughter, Inc., Philadelphia	697
Newbold, R. S., & Sons Co., Norristown, Pa.	722
Nordberg Mfg. Co., Milwaukee	728-729
Perry & Webster, Inc., New York	760-761

ENGINEERS, PUMPING

Hope Engineering & Supply Co., Mt. Vernon, O.	572
Nordberg Mfg. Co., Milwaukee	728-729
Sullivan Machinery Co., Chicago	872

ENGINEERS, REFRIGERATION

Hope Engineering & Supply Co., Mt. Vernon, O.	572

ENGINEERS, SUGAR

Badger, E. B., & Sons Company, Boston	310-329
Buffalo Foundry & Machine Co., Buffalo	374-379
Cannon-Swenson Co., Chicago	384-385
Lewis, Green, McAdams & Knowland, Boston	664
Meigs, Bassett & Slaughter, Inc., Philadelphia	697
Newbold, R. S., & Sons Co., Norristown, Pa	722
Reading Iron Co., Reading, Pa.	796-797
U. S. & Cuban Allied Works Engineering Corpn., New York	920

ENGINES, AIR EXPANSION

Nordberg Mfg. Co., Milwaukee	728-729

ENGINES, AUTOMATIC, VERTICAL OR HORIZONTAL

Troy Engine & Machine Works, Troy, Pa.	900-901

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Ingersoll-Rand Co., New York	590-593
Nordberg Mfg. Co., Milwaukee	728-729
Roots, P. H. & F. M., Co., Connersville, Ind.	811

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Sullivan Machinery Co., Chicago... 872
Westinghouse Elec. & Mfg. Co., East Pittsburgh 946-961
Worthington Pump & Mach. Corpn., New York 1072-1075

ENGINES, CORLISS
Glander & Company, Newark, N J. 524-525
Nordberg Mfg. Co., Milwaukee 728-729
Vilter Manufacturing Co., Milwaukee 924
Worthington Pump & Mach. Corpn., New York 1072-1075
Frick Company, Inc, Waynesboro, Pa.
Hewes & Phillips Iron Wks, Newark, N J
Hooven, Owens, Rentschler Co, Hamilton, O
Murray Iron Wks. Co, Burlington, Ia

ENGINES, DEEP WELL
American Well Works, Aurora, Ill 286

ENGINES, DIESEL
Hope Engineering & Supply Co., Mt Vernon, O. 572
Ingersoll-Rand Co., New York ..590-593
Nordberg Mfg. Co., Milwaukee. . 728-729
Busch-Sulzer-Bros -Diesel Eng Co, St Louis
Fulton Iron Wks, St Louis
McIntosh & Seymour Corpn, Auburn, N Y.
Midwest Eng. Co, Indianapolis
New London Ship & Eng. Co., Groton, Conn.
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ENGINES, GAS, "WHITE AND MIDDLETON"
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Consolidated Products Co., New York 411
Fairbanks, Morse & Co., Chicago 473
Glander & Company, Newark, N J 524-525
Hope Engineering & Supply Co., Mt Vernon, O 572
Ingersoll-Rand Co., New York 590-593
Mine & Smelter Suply Co., New York 704-705
Raymond Engineering Corpn. New York 794
Worthington Pump & Mach. Corpn., New York 1072-1075

ENGINES, GAS, "REEVES"
Hope Engineering & Supply Co., Mt Vernon, O . . 572

ENGINES, HAULING, COAL CARS
Haiss, George, Mfg. Co., New York 542-543

ENGINES, HIGH SPEED
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Troy Engine & Machine Co., Troy, Pa. 900-901
Vilter Manufacturing Co., Milwaukee, ... 924

ENGINES, HOISTING
Fairbanks, Morse & Co., Chicago 473
Haiss, George, Mfg. Co., New York 542-543
Nordberg Mfg. Co., Milwaukee 728-729
Sullivan Machinery Co., Chicago 872

ENGINES, JORDAN
Black-Clawson Co, Hamilton, O
Dillon Mach Co, Lawrence, Mass.
Jones, E. D., & Sons Co., Pittsfield, Mass
McKim Fdry. & Mach. Co, Lockport, N Y
Noble & Wood Mach. Co, Hoosick Falls, N. Y.

ENGINES, MARINE
Morris Machine Works, Baldwinsville, N Y........ 711
Nordberg Mfg. Co., Milwaukee... 728-729

ENGINES, OIL
Consolidated Products Co., New York 411
Fairbanks, Morse & Co., Chicago 473
Hope Engineering & Supply Co., Mt Vernon, O 572
Ingersoll-Rand Co., New York 590-593
Nordberg Mfg. Co., Milwaukee 728-729
Worthington Pump & Mach. Corpn., New York 1072-1075
Allis-Chalmers Mfg. Co., Milwaukee
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ENGINES, OIL, SEMI-DIESEL
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ENGINES, POPPET VALVE
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Glander & Company, Newark, N. J 524-525
Mine and Smelter Supply Co., New York 704-705
Morris Machine Works, Baldwinsville, N Y 711
Nordberg Mfg. Co., Milwaukee 728-729
Sturtevant, B. F., Co., Hyde Park, Boston 869
Troy Engine & Machine Co., Troy, Pa. 900-901
Vilter Manufacturing Co., Milwaukee 924
Worthington Pump & Mach. Corpn., New York 1072-1075
Allis-Chalmers Mfg. Co, Milwaukee
Amer Eng & Elec Co, Bound Brook, N. J
Ball Engine Co, Erie, Pa.
Bass Fdy & Mach Co, Ft. Wayne Ind
Bay City Iron Co., Bay City, Mich
Clark Eng & Boiler Co, Kalamazoo, Mich
Clyde Iron Wks, Duluth, Minn
Erie City Iron Wks, Erie, Pa
Fitchburg Steam Eng. Co, Fitchburg, Mass.
Goldie & McCulloch Co, Galt, Ont
Hardie, Tynes Mfg. Co, Birmingham, Ala
Harris, Corliss Eng & Mach. Co, Providence
Hewes & Phillips Iron Wks, Newark N J
Hooven, Owens, Rentschler Co, Hamilton, O.
Moore Steam Turbine Corpn, Wellsville, N Y
Murray Iron Wks Co., Burlington, Ia
Phœnix Iron Wks. Co., Meadville, Pa
Skinner Engine Co, Erie, Pa
Wetherill, Robt, & Co, Chester, Pa.

ENGINES, THROTTLING, HORIZONTAL, HIGH AND LOW PRESSURE TYPES
Troy Engine & Machine Co., Troy, Pa 900-901

ENGINES, THROTTLING, VERTICAL, HIGH AND LOW PRESSURE TYPES
Troy Engine & Machine Co., Troy, Pa 900-901

ENGINES, VACUUM
Nordberg Mfg. Co., Milwaukee... 728-729

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ENGRAVING GLASSWARE
Glass Specialty Co., Newark, N J 523
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Essex Aniline Wks., Boston

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Knight, Maurice A., East Akron, O 638-649

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Bush, W. J., & Co., Inc., New York 1101
Cooper, Chas., & Co., New York .. 1111
Du Pont De Nemours, E. I., & Co., Wilmington 1116-1118
Marshall Richa, Inc., Baltimore .. 692
Powers - Weightman - Rosengarten Co., Philadelphia 1172
U. S. Industrial Chemical Co., New York 1204-1205
Merck & Co, New York
N W. Chem Co., Wauwatosa, Wis
Squibb-Carter-Squibb Co., Lawrenceburg, Ind
Squibb, E. R, & Sons, New York

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Baker, J. T., Chemical Co., Phillipsburg, N. J 1095

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Franco Amer Chem. Wks, Carlstadt, N. J.

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Fries & Fries Co., Cincinnati 1122
Kenart Synth. Prod Co., Chicago
N. W. Chem. Co., Wauwatosa, Wis.

ETHER, PELARGONIC
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Arctic Ice Machine Co., Canton, O. 291
Automatic Refrigerating Co., Hartford 307
York Manufacturing Co., York, Pa 1080
De La Vergne Mach Co, New York
Frick Co, Waynesboro, Pa

JOINTS, "ATWOOD" LINE AND PIPE
Pittsburgh Valve, Foundry & Construction Co., Pittsburgh .. 766-768

JOINTS, CAST-IRON
Pittsburgh Valve, Foundry & Construction Co., Pittsburg . 766-768
Power Piping Company, Pittsburgh . .776-777
U S Cast Iron Pipe & Foundry Co, Burlington, N J

JOINTS, DOUBLE LAP
Power Piping Company, Pittsburgh 776-777
Whitlock Coil Pipe Co., Hartford, Conn 966-967
Ballwood Co, New York
Pittsburgh Piping & Equip. Co, Pittsburgh

JOINTS, EXPANSION
Acme Coppersmith Co., Chicago ... 249
Aterite Company, New York 300-301
Badger, E. B., & Sons Co., Boston 310-329
Crane Co., Chicago 420-421
Groen Mfg. Co., Chicago 538
Kellogg, M. W., Co., New York ..622-623
Kelly & Jones Co., Greensburg, Pa.624-625
Kopperman, Jos., & Sons, Philadelphia 650
Koven, L. O., & Brother, Jersey City 651
Oat, Joseph, & Sons, Philadelphia.. 735
Ott, George F., Co., Philadelphia . 744
Pittsburgh Valve, Foundry & Construction Co., Pittsburgh ...766-768
Power Piping Company, Pittsburgh 776-777
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JOINTS, EXPANSION, CROSSHEAD-GUIDED
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JOINTS, EXPANSION, ROOFING
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JOINTS, FLANGED PIPE
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Dougherty, M. J., Co., Philadelphia 442-443

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- **Kellogg, M. W., Co.,** New York 622-623
- **Kelly & Jones Co.,** Greensburg, Pa 624-625
- **Mitchell, W. K., & Co.,** Philadelphia 703
- **Pittsburgh Valve, Foundry & Construction Co.,** Pittsburgh 766-768
- **Power Piping Company,** Pittsburgh 776-777
- **Simmons Pipe Bending Works,** Newark N J 834
- **Whitlock Coil Pipe Co.,** Hartford 966-967

JOINTS, FLANGED PIPE, SQUARE LAP

- **Dougherty, M. J., Co.,** Philadelphia 442-443

JOINTS, LAP

- **Simmons Pipe Bending Works,** Newark N J 834

JOINTS, PIPE, "VAN STONE"

- **Dougherty, M. J., Co.,** Philadelphia 442-443
- **Simmons Pipe Bending Works,** Newark N J 834

JOINTS, PIPE, "VAN STONE" WROUGHT

- **Mitchell, W. K., & Co.,** Philadelphia 442-443

JOINTS, SUCKER ROD

- **American Well Works,** Aurora, Ill 286

JOINTS, SWING, "ATERITE & FANOSITE"

- **Aterite Company,** New York 300-301

JOINTS, SWING, PIPE

- **Kelly & Jones Co.,** New York 624-625
- **Pittsburgh Valve, Foundry & Construction Co.,** Pittsburgh 766-768
- Williams, Franklin, New York

JOINTS, WROUGHT IRON

- **Reading Iron Co.,** Reading Pa 796-797

JUTE

- **Jardine, Matheson & Co.,** New York 1110

KAOLIN. See Clay, China

KAOLIN, WASHED IN ACID, "BAKER'S

- **Baker, J. T., Chemical Co.,** Phillipsburg, N J 1095

"KALKSPAR"

- **Roessler & Hasslacher Chemical Co.,** New York 1178-1179

"KARBUROL"

- Cynol Prod Co, Boston

KEGS, WOODEN

- **American Stave & Cooperage Co.,** Chelsea, Mass 278
- **International Cooperage Co., Inc.,** Niagara Falls 589
- **Moore, Lucius, Stave Co.,** New York 708
- **O'Malley's Cooperage, Inc.,** Brooklyn, N Y 731

KELENE. See Ethyl Chloride

"KELLY" FILTER PRESSES. See Filter Presses, "Kelly"

KELP, GROUND, DRY

- Puget Sound Potash & Kelp Co, Seattle

"KENOTRONS"

- **General Electric Co.,** Schenectady 508-517

"KEROLENE"

- Bosson & Lane, Atlantic, Mass

KEROSENE. See Petroleum Products

KETONE, METHYLETHYL

- **Albany Chemical Company,** Albany, N Y 1087
- **U. S. Industrial Chemical Co.,** New York 1204-1205
- Delta Chem Co, Wells, Mich
- Melville Corbett Co., St Marys, Pa
- Norwick Chem. Co., E Smethport, Pa
- Standard Chem Co, Toronto

KETONE, MICHLER'S

- **Butterworth - Judson Corpn.,** New York 1102

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KETONE SOLVENT

- **Cooper, Chas., & Co.,** New York 1111

KETTLES, ACETONE

- **Kutztown Foundry & Machine Co.,** Philadelphia 652-653
- **Struthers-Wells Co.,** Warren, Pa 864-865
- **Townsend Furnace & Machine Shop Co.,** Albany, N Y 893

KETTLES, ALUMINUM

- **Acme Coppersmithing Co.,** Chicago 249
- **Badger, E. B., & Sons Co.,** Boston 310-329
- **Consolidated Products Co.,** New York 411
- **Groen Mfg. Co.,** Chicago 538
- **Roos, Chas. A., Inc.,** New York 810
- **Walter, Theo. C., Jr.,** Newark, N. J. 933
- Aluminum Company of Amer., Pittsburgh

KETTLES, ALUMINUM—Con. PAGE

- Bramhall-Deane Company, New York
- Curtis Bay Copper & Iron Wks., Curtis Bay, Md
- Seizan, John, Newark, N J

KETTLES, ASPHALT HEATING

- **Stuebner, G. L.,** Long Island City, N Y 867

KETTLES, CAST-IRON

- **Bethlehem Foundry & Machine Corpn.,** New York 350-352
- **Brady, Jas. A., Foundry Co.,** Chicago 364
- **Buffalo Foundry & Machine Co.,** Buffalo 374-379
- **Buffalo Steam Pump Co.,** Buffalo 373
- **Chicago Bridge & Iron Works,** Chicago 399
- **Consolidated Products Co.,** New York 411
- **Dopp, H. W., Co.,** Buffalo 840-843
- **Fuller-Lehigh Company,** Fullerton Pa 492-493
- **Garrigue, William, & Company,** Chicago and New York 496-501
- **Glamorgan Pipe & Foundry Co.,** Lynchburgh, Va 520-521
- **Glander & Company,** Newark N J 524-525
- **Hercules Engineering Corpn.,** New York 556-559
- **Jacoby, Henry E.,** New York 603
- **Keeler, E., Co.,** Williamsport, Pa 620
- **Kutztown Foundry & Machine Co.,** Philadelphia 652-653
- **Long Island Foundry Co.,** Long Island City, N Y 669
- **Mott, J. L., Iron Works,** New York 713
- **Newbold, R. S., & Sons Co.,** Norristown, Pa 722
- **Nordberg Mfg. Co.,** Milwaukee 728-729
- **Reading Iron Co,** Reading, Pa 796-797
- **Rosedale Foundry & Machine Co.,** Pittsburgh 812
- **Sowers Mfg. Co.,** Buffalo 840-843
- **Sperry, D. R., & Co.,** Batavia, Ill 844-846
- **Stuart & Peterson Co.,** Burlington, N J 866
- **Townsend Furnace & Machine Shop Co.,** Albany N Y 893
- **U. S. Cast Iron Pipe & Foundry Co.,** Burlington, N J 916-917

KETTLES, CAUSTIC SODA

- **Bethlehem Foundry & Machine Co.,** Bethlehem Pa 358-361
- **Blaw-Knox Co.,** Pittsburgh 358-361
- **Brady, Jas. A., Foundry Co.,** Chicago 364
- **Buffalo Foundry & Machine Co.,** Buffalo 374-379
- **Devine, J. P., Company,** Buffalo 436-437
- **Dopp, H. W., Co.,** Buffalo 840-843
- **Duriron Company,** Dayton O 450-453
- **Fuller-Lehigh Company,** Fullerton, Pa 492-493
- **Garrigue, William, & Company,** Chicago and New York 496-501
- **Glamorgan Pipe & Foundry Co.,** Lynchburg Va 520-521
- **Glander & Company,** Newark, N J 524-525
- **Hercules Engineering Corpn.,** New York 556-559
- **Jacoby, Henry E.,** New York 603
- **Kellogg, M. W., Co.,** New York 622-623
- **Kutztown Foundry & Machine Co.,** Philadelphia 652-653
- **Mott, J. L., Iron Works,** New York 713
- **Newbold, R. S., & Sons Co.,** Norristown, Pa 722
- **New York Central Iron Works Co.,** Hagerstown, Md 726
- **Reading Iron Co.,** Reading, Pa 796-797
- **Rosedale Foundry & Machine Co.,** Pittsburgh 812
- **Sowers Mfg. Co.,** Buffalo 840-843
- **Sperry, D. R., & Co.,** Batavia, Ill 844-846
- **U. S. Cast Iron Pipe & Foundry Co.,** Burlington, N J 916-917

KETTLES, "CHEMI-STEEL"

- **Kellogg, M. W., Co.,** New York 622-623

KETTLES, COLOR. See Kettles, Dye

KETTLES, COPPER

- **Acme Coppersmithing Co.,** Chicago 249
- **Badger, E. B., & Sons Co.,** Boston 310-329
- **Baltimore Coppersmith Co.,** Baltimore 334
- **Berry, A., Copper Works,** New York 348
- **Buffalo Steam Pump Co.,** Buffalo 373
- **Chesapeake Coppersmithing Co.,** Baltimore 397
- **Colton, Arthur, Company,** Detroit 409
- **Consolidated Products Co.,** New York 411
- **Detroit Heating & Lighting Co.,** Detroit 433
- **Garrigue, William, & Company,** Chicago and New York 496-501
- **Glander & Company,** Newark, N. J 524-525
- **Groen Mfg. Co.,** Chicago 538
- **Keller, George, Copper Works,** Brooklyn 621

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- **Kopperman, Jos., & Sons,** Philadelphia 650
- **Koven, L. O., & Brother,** Jersey City 651
- **Liberty Coppersmithing Co.,** Philadelphia 666
- **Lummus, Walter E., Co.,** Boston 674-681
- **Oakland Copper and Brass Works,** Oakland, Cal 732-733
- **Oat, Joseph, & Sons,** Philadelphia 735
- **Ott, George F., Co.,** Philadelphia 744
- **Roos, Chas. A., Inc,** New York 810
- **Textile-Finishing Machinery Co.,** Providence 884
- **Vendome Copper & Brass Works,** Louisville 923
- **Walter, Theo. C., Jr.,** Newark, N. J. 933
- **Welded Steel Barrel Corpn.,** Detroit 433

KETTLES, CRYSTALLIZING

- **Acme Coppersmithing Co.,** Chicago 249
- **Badger, E. B., & Sons Co.,** Boston 310-329
- **Baltimore Coppersmith Co.,** Baltimore 334
- **Bethlehem Foundry & Machine Co.,** Bethlehem Pa 358
- **Berry, A., Copper Works,** New York 348
- **Blaw-Knox Co.,** Pittsburgh 358-361
- **Brady, Jas. A., Foundry Co.,** Chicago 364
- **Buffalo Foundry & Machine Co.,** Buffalo 374-379
- **Chesapeake Coppersmithing Co.,** Baltimore 397
- **Chicago Bridge & Iron Works,** Chicago 399
- **Consolidated Products Co.,** New York 411
- **Corbett, Geo. E., Boiler & Tank Co.,** Chicago 416
- **Dopp, H. W., Co.,** Buffalo 840-843
- **Glander & Company,** Newark, N. J 524-525
- **Jacoby, Henry E.,** New York 603
- **Keeler, E., Company,** Williamsport, Pa 620
- **Keller, George, Copper Works,** Brooklyn 621
- **Kellogg, M. W., Co.,** New York 622-623
- **Kopperman, Jos., & Sons,** Philadelphia 650
- **Kutztown Foundry & Machine Co.,** Philadelphia 652-653
- **Lebanon Boiler Works,** Lebanon, Pa 662
- **Liberty Coppersmithing Co.,** Philadelphia, Pa 666
- **Lummus, Walter E., Co.,** Boston 674-681
- **Mott, J. L., Iron Works,** New York 713
- **Oldman Boiler Works,** Buffalo 740
- **Petty, J. K., & Co.,** Philadelphia 662
- **Pfaudler Co.,** Rochester 762
- **Reading Iron Co.,** Reading, Pa 796-797
- **Rosedale Foundry & Machine Co.,** Pittsburgh 812
- **Sowers Mfg. Co.,** Buffalo 840-843
- **Sperry, D. R., & Co.,** Batavia, Ill 844-846
- **Stuebner, G. L.,** Long Island City, N Y 867
- **Walter, Theo. C., Jr.,** Newark, N J 933
- **Warren City Tank & Boiler Co.,** Warren, O 937

KETTLES, DESILVERING

- **Fuller-Lehigh Company,** Fullerton, Pa 492-493

KETTLES, "DOPP"

- **Sowers Mfg. Co.,** Buffalo 840-843

KETTLES, DYE

- **Acme Coppersmithing Co.,** Chicago 249
- **Baltimore Coppersmith Co.,** Baltimore 334
- **Chesapeake Coppersmithing Co.,** Baltimore 397
- **Consolidated Products Co.,** New York 411
- **Dopp, H. W., Co.,** Buffalo 840-843
- **Elyria Enameled Products Co.,** Elyria, O 466
- **Glander & Company,** Newark, N J 524-525
- **Groen Mfg. Co.,** Chicago 538
- **Jacoby, Henry E.,** New York 603
- **Kellogg, M. W., Co.,** New York 622-623
- **Kopperman, Jos., & Sons,** Philadelphia 650
- **Lummus, Walter E., Co.,** Boston 674-681
- **Mott, J. L., Iron Works,** New York 713
- **Oakland Copper & Brass Works,** Oakland, Cal 732-733
- **Oat, Joseph, & Sons,** Philadelphia 735
- **Ott, George F., Co.,** Philadelphia 744
- **Pfaudler Co.,** Rochester 762
- **Roos, Chas. A., Inc.,** New York 810
- **Sowers Mfg. Co.,** Buffalo 840-843
- **Sperry, D. R., & Co.,** Batavia, Ill 844-846
- **Stuart & Peterson Co.,** Burlington, N J 866
- **Textile-Finishing Machinery Co.,** Providence 884
- **Walter, Theo. C., Jr.,** Newark, N J. 933

KETTLES, ENAMELED

- **Consolidated Products Co.,** New York 411
- **Elyria Enameled Products Co.,** Elyria, O. 466

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- **Mott, J. L., Iron Works,** New York 713
- **Pfaudler Company,** Rochester... 762
- **Sperry, D. R., & Co.,** Batavia, Ill 844-846
- **Stuart & Peterson Co.,** Burlington, N J 866

KETTLES, GLASS-ENAMELED

- **Elyria Enameled Products Co.,** Elyria, O 466
- **Pfaudler Company,** Rochester. . 762

KETTLES, GREASE, STEEL

- **Blaw-Knox Company,** Pittsburgh 358-361
- **Warren City Tank & Boiler Co.,** Warren O 937

KETTLES, HEATING, ASPHALT

- **Stuebner, G. L.,** Long Island City 867

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- **Abernethy, John F.,** Brooklyn, N Y . 246
- **Acme Coppersmithing Co.,** Chicago 249
- **American Lead Burning Corpn.,** New York 271
- **Badger, E. B., & Sons Co.,** Boston 310-329
- **Bethlehem Foundry & Machine Co.,** Bethlehem Pa 353
- **Bethlehem Foundry & Machine Corpn.,** New York 350-352
- **Groen Mfg. Co.,** Chicago . 538
- **Jacoby, Henry E.,** New York 603
- **Kopperman, Jos., & Sons,** Philadelphia . 650
- **Lummus, Walter E., Co.,** Boston 674-681
- **Oakland Copper & Brass Works,** Oakland, Cal . . 732-733
- **Sperry, D. R., & Co.,** Batavia, Ill 844-846
- **United Lead Company,** New York 911-915

KETTLES, MIXING

Any of the manufacturers of kettles will supply them equipped with agitators or stirrers, thereby making them mixing kettles, hence look under the material which the kettle is to be made

KETTLES, NITRATING. See Nitrators

KETTLES, OIL-JACKETED

- **Bethlehem Foundry & Machine Corpn.,** New York . . 350-352
- **Dopp, H. W.,** Buffalo . 840-843
- **Glander & Company,** Newark, N J 524-525
- **Sowers Mfg. Co.,** Buffalo . .840-843

KETTLES, PAINT

- **New York Central Iron Works Co.,** Hagerstown, Md 726

KETTLES, PLATED STEEL

- **Kellogg, M. W., Co.,** New York .622-623

KETTLES, REDUCTION. See Reducers

KETTLES, SMELTING

- **Rosedale Foundry & Machine Co.,** Pittsburgh . . 812

KETTLES, SOAP

- **Dopp, H. W., Co.,** Buffalo 840-843
- **Garrigue, William & Company,** Chicago and New York 496-501
- **New York Central Iron Works Co.,** Hagerstown, Md . 726
- **Sowers Mfg. Co.,** Buffalo 840-843
- **Struthers-Wells Co.,** Warren, Pa 864-865

KETTLES, SILVER PLATED

- **Kellogg, M. W., Co.,** New York 622-623

KETTLES, STEAM-JACKETED

- **Acme Coppersmithing Co.,** Chicago 249
- **Allbright-Nell Co.,** Chicago 260
- **American Welding Co.,** Carbondale, Pa 285
- **Badger, E. B., & Sons Co.,** Boston 310-329
- **Baltimore Coppersmith Co.,** Baltimore . 334
- **Berry, A., Copper Works,** New York 348
- **Bethlehem Foundry & Machine Co.,** Bethlehem, Pa. 353
- **Bethlehem Foundry & Machine Corpn.,** New York . . 350-352
- **Biggs Boiler Works,** Akron, O 355
- **Blaw-Knox Company,** Pittsburgh 358-361
- **Brady, Jas. A., Foundry Co.,** Chicago 364
- **Buffalo Foundry & Machine Co.,** Buffalo 374-379
- **Chesapeake Coppersmithing Co.,** Baltimore 397
- **Chicago Bridge & Iron Works,** Chicago 399
- **Colton, Arthur, Company,** Detroit 409
- **Consolidated Products Co.,** New York 411
- **Corbett, Geo. E., Boiler & Tank Co.,** Chicago . .. 416
- **Cruse-Kemper Company,** Ambler, Pa. 425
- **Day, J. H., Company,** Cincinnati... 431
- **Detroit Heating & Lighting Co.,** Detroit 433
- **Devine, J. P., Co.,** Buffalo.........436-437
- **Dopp, H. W., Co.,** Buffalo........840-843

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- **Downingtown Iron Works, Inc.,** Downingtown, Pa 445
- **Duriron Company,** Dayton, O . . .450-453
- **Elyria Enameled Products Co.,** Elyria, O 466
- **Eureka Machine Co.,** Cleveland . 469
- **Garrigue, William, & Company,** Chicago and New York 496-501
- **Glander & Company,** Newark, N J 524-525
- **Groen Mfg. Co.,** Chicago . 538
- **Hercules Engineering Corpn.,** New York 556-559
- **Hodge Boiler Works,** East Boston, Mass . . 564
- **Houchin-Aiken Co.,** Brooklyn 578-579
- **International Engineering Works, Inc.,** Framingham Mass 594-595
- **Jacoby, Henry E.,** New York 603
- **Keeler, E., Company,** Williamsport, Pa . 620
- **Keller, George, Copper Works,** Brooklyn 621
- **Kellogg, M. W., Co.,** New York 622-623
- **Kopperman, Jos., & Sons,** Philadelphia . . 650
- **Koven, L. O., & Brother,** Jersey City 651
- **Kutztown Foundry & Machine Co.,** Philadelphia 652-653
- **Lancaster Iron Works,** Lancaster Pa . . . 656-657
- **Lebanon Boiler Works,** Lebanon Pa 662
- **Liberty Coppersmithing Co.,** Philadelphia . . . 666
- **Lummus, Walter E., Co.,** Boston 674-681
- **Mott, J. L., Iron Works,** New York 713
- **Newbold, R. S., & Sons Co.,** Norristown, Pa . 722
- **New York Central Iron Works Co.,** Hagerstown Md 726
- **Nordberg Mfg. Co.,** Milwaukee 728-729
- **Oakland Copper & Brass Works,** Oakland, Cal . 732-733
- **Oat, Joseph, & Sons,** Philadelphia. 735
- **Oldman Boiler Works,** Buffalo 740
- **Ott, George F., Co.,** Philadelphia 744
- **Petty, J. K., & Co.,** Philadelphia. . 662
- **Pfaudler Co.,** Rochester, N Y . 762
- **Roos, Chas. A., Inc.,** New York 810
- **Rosedale Foundry & Machine Co.,** Pittsburgh . . 812
- **Sowers Mfg. Co.,** Buffalo 840-843
- **Sperry, D. R., & Co.,** Batavia, Ill 844-846
- **Stokes, F. J., Machine Co.,** Philadelphia 858-860
- **Struthers-Wells Co.,** Warren, Pa 864-865
- **Stuart & Peterson Co.,** Burlington, N. J 866
- **Stuebner, G. L.,** Long Island City, N Y 867
- **Tippett & Wood,** Phillipsburg, N J 891
- **United Lead Company,** New York 911-915
- **Vendome Copper & Brass Works,** Louisville . 923
- **Walter, Theo. C., Jr.,** Newark, N J 933
- **Warren City Tank & Boiler Co.,** Warren 937
- **Welded Steel Barrel Corpn.,** Detroit 433

KETTLES, STEAM-JACKETED, FORGE-WELDED

- **American Welding Co.,** Carbondale Pa 285
- **Blaw-Knox Co.,** Pittsburgh 358-361
- **Kellogg, M. W., Co.,** New York 622-623

KETTLES, STEEL, COPPER-PLATED

- **Kellogg, M. W., Co.,** New York 622-623

KETTLES, STEEL, FORGE-WELDED

- **American Welding Co.,** Carbondale, Pa 285
- **Blaw-Knox Co.,** Pittsburgh 358-361
- **Kellogg, M. W., Co.,** New York 622-623

KETTLES, STONEWARE, ALL TYPES

- **Acid Proof Clay Products Co.,** Akron, O . . 248
- **General Ceramics Company,** New York . . 504-507
- **Knight, Maurice A.,** East Akron, O 638-649

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- **Beckley Perforating Co.,** Garwood, N J 345
- **Biehl Iron Works,** Reading, Pa. . 354
- **Blaw-Knox Co.,** Pittsburgh .358-361
- **Chicago Bridge & Iron Works,** Chicago 399
- **Consolidated Products Co.,** New York 411
- **Downingtown Iron Works, Inc.,** Downingtown, Pa 445
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- **Eureka Machine Co.,** Cleveland... 469
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- **Koven, L. O., & Brother,** Jersey City, N. J.................. 651

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- **Kutztown Foundry & Machine Co.,** Philadelphia 652-653
- **Lebanon Boiler Works,** Lebanon, Pa. 662
- **Lummus, Walter E., Co.,** Boston.674-681
- **Newbold, R. S., & Sons Co.,** Norristown, Pa . . 722
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- **Petty, J. K., & Co.,** Philadelphia... 662
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- **Sperry, D. R., & Co.,** Batavia, Ill 844-846
- **Struthers-Wells Co.,** Warren, Pa.864-865
- **Stuebner, G. L.,** Long Island City, N Y 867
- **Warren City Tank & Boiler Co.,** Warren, O 937

KETTLES, TIN OR SILVER-LINED

- **Acme Coppersmithing Co.,** Chicago 249
- **Badger, E. B., & Sons Co.,** Boston 310-329
- **Groen Mfg. Co.,** Chicago . . 538
- **Lummus, Walter E., Co.,** Boston 674-681
- **Kellogg, M. W., Co.,** New York 622-623
- **Kopperman, Jos., & Sons,** Philadelphia . 650
- **Oakland Copper & Brass Works,** Oakland, Cal . . .732-733
- **Ott, Geo. F., Co.,** Philadelphia .. 744
- **Roos, Chas. A., Inc.,** New York 810
- **United Lead Company,** New York.911-915

KETTLES, VACUUM

- **Acme Coppersmithing Co.,** Chicago 249
- **Badger, E. B., & Sons Co.,** Boston 310-329
- **Baltimore Coppersmith Co.,** Baltimore . . 334
- **Berry, A., Copper Works,** New York 348
- **Bethlehem Foundry & Machine Corpn.,** New York . 350-352
- **Blaw-Knox Company,** Pittsburgh 358-361
- **Brady, James A., Foundry Co.,** Chicago 361
- **Buffalo Foundry & Machine Co.,** Buffalo 374-379
- **Chesapeake Coppersmithing Co.,** Baltimore 397
- **Consolidated Products Co.,** New York 411
- **Corbett, Geo. E., Boiler & Tank Co.,** Chicago 416
- **Cruse-Kemper Co.,** Ambler, Pa .. 425
- **Devine, J. P., Co.,** Buffalo 436-437
- **Dopp, H. W., Co.,** Buffalo .. 840-843
- **Elyria Enameled Products Co.,** Elyria, O 466
- **Garrigue, William & Company,** Chicago and New York 496-501
- **General Ceramics Company,** New York 504-507
- **Glander & Company,** Newark, N J 524-525
- **Groen Mfg. Co.,** Chicago ... 538
- **Jacoby, Henry E.,** New York .. 603
- **Hodge Boiler Works,** East Boston, Mass 564
- **Keller, George, Copper Works,** Brooklyn 621
- **Kellogg, M. W., Co.,** New York 622-623
- **Kopperman, Jos., & Sons,** Philadelphia . . . 650
- **Kutztown Foundry & Machine Co.,** Philadelphia 652-653
- **Lancaster Iron Works,** Lancaster, Pa 656-657
- **Lebanon Boiler Works,** Lebanon, Pa . . 662
- **Liberty Coppersmithing Co.,** Philadelphia 666
- **Lummus, Walter E., Co.,** Boston 674-681
- **Newbold, R. S., & Sons Co.,** Norristown, Pa 722
- **New York Central Iron Works Co.,** Hagerstown, Md 726
- **Nordberg Mfg. Co.,** Milwaukee 728-729
- **Oakland Copper & Brass Works,** Oakland, Cal 732-733
- **Oat, Joseph, & Sons,** Philadelphia. 735
- **Oldman Boiler Works,** Buffalo .. 740
- **Ott, George F., Co.,** Philadelphia . 744
- **Petty, J. K., & Co.,** Philadelphia. . 662
- **Pfaudler Co.,** Rochester 762
- **Roos, Chas. A., Inc.,** New York 810
- **Rosedale Foundry & Machine Co.,** Pittsburgh . . 812
- **Scott, Ernest, & Co.,** Fall River, Mass 828
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Perrin, Wm R, & Co, Chicago
Van Atta, E B, Co, Olean, N Y

OIL ORANGE
Heller & Merz Co., New York 1128
Klipstein, A., & Co., New York ... 1143
Metz, H. A., & Co., New York . 1154
Central Dyestuff & Chem Co, Newark, N J
Foster, Heaton Co, Newark, N J
Frost, F W, & Co., New York
Kenart Synth Prod Co, Chicago
Stubner Chem Wks, Elizabeth N. J

OIL ORANGE, EXTRA
Newport Chemical Works, Inc., Passaic, N J. 1164-1165

OIL PINK
Foster-Heaton Co, Newark, N J

OIL RECOVERY APPARATUS. See Extractors, Oil

OIL RED
Heller & Merz Co., New York . . 1128
Klipstein, A., & Co., New York. . 1143
Metz, H. A., & Co., New York 1154
Newport Chemical Works, Inc., Passaic, N J . .. 1164-1165
Central Dyestuff & Chem Co, Newark, N J
Foster-Heaton Co, Newark, N J
Kenart Synth Prod Co, Chicago

OIL REFINING MACHINERY, EDIBLE OILS
Allbright-Nell Co., Chicago 260
Anderson, V. D., Co., Cleveland .290-291
Garrigue, William, & Company, Chicago and New York 496-501
Lummus, Walter E., Co., Boston 674-681
Vogt, Henry, Machine Company, Louisville . . 926-927

OIL SCARLET
Heller & Merz Co., New York 1128
Klipstein, A., & Co., New York .. 1143
Metz, H. A., & Co., New York 1154
Newport Chemical Works, Inc., Passaic, N J 1164-1165
Central Dyestuff & Chem Co Newark, N J.
Foster-Heaton Co, Newark, N. J

OIL SPRAYERS, "TURBO"
Parks-Cramer Company, Fitchburg, Mass 750

OIL TESTING APPARATUS. See Testers, Oil

OIL, VIOLET
Foster-Heaton Co, Newark, N J.

OIL, WALNUT
Foster-Heaton Co, Newark, N. J.

OIL YELLOW
Heller & Merz Co., New York 1128
Klipstein, A., & Co., New York .. 1143
Metz, H. A., & Co., New York . 1154
Newport Chemical Works, Inc., Passaic N J 1164-1165
Amer Color Mfg. Co., Passaic, N J
Central Dyestuff & Chem. Co., Newark, N. J.

OIL YELLOW—Con. PAGE
Foster-Heaton Co., Newark, N. J.
Frost, F. W., & Co, New York
Kenart Synth. Prod. Co., Chicago
Organic Prod. Corpn., Schenectady

OILERS, AUTOMATIC, PNEUMATIC
Chicago Pneumatic Tool Co., New York 400-403

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"OLEITE"
Oleite Corpn, New York

OLEO MARGARINE PLANTS. See Margarine Plants

OLEO PLANT EQUIPMENT
Allbright-Nell Co., Chicago .. 260
Dopp, H. W., Co., Buffalo 840-843
Garrigue, William, & Company, Chicago and New York 496-501
Sowers Mfg. Co., Buffalo 840-843

OLEO RESINS
Bush, W. J., & Co., Inc., New York 1101
Chiris, Antoine, Co., New York 1108
Kenart Synth Prod Co, Chicago
Magnus, Mabee & Reynard, New York
Orbis Prod Trading Co, New York
Ungerer & Co, New York

OLEO-STEARIN. See Stearin, Oleo

OLEUM. See Acid, Sulfuric, Fuming

"OLIVER" CONTINUOUS FILTER
Oliver Continuous Filter Co., San Francisco and New York 736-739

OMOROL
Heyden Chemical Co., Garfield, N J. 1131

ONE-BATH TANNAGE. See Tannage, One-Bath

OPAL BLUE
Cosmos Chemical Co, Plainfield, N J

OPTICAL GLASSES
Bausch & Lomb Optical Co., Rochester 340-341
Corning Glass Works, Corning, N. Y. 418

OPTICAL INSTRUMENTS. See also Laboratory Apparatus
Bausch & Lomb Optical Co., Rochester . 340-341
Eimer & Amend, New York 457
Will Corporation, Rochester , 972-1066
Gaertner, Wm, & Co, Chicago
Scientific Materials Co, Pittsburgh

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ORANGE G
Klipstein, A., & Co., New York 1143
Metz, H. A., & Co., Inc., New York 1154
Central Dyestuff & Chem Co, Newark, N J

ORANGE GG
Sherwin-Williams Co, Cleveland

ORANGE GGR
Peerless Color Co, Bound Brook, N J

ORANGE I
Chaplain & Bibbo, New York . 1106
Metz, H. A., & Co., Inc., New York 1154
Central Dyestuff & Chem Co, Newark, N J
Kenart Synth Prod Co, Chicago
Heath Mfg Co, St Louis
Hord Color Products Co, Sandusky

ORANGE II. See Acid Orange II

ORANGE Y
Metz, H. A., & Co., Inc., New York 1154
Central Dyestuff & Chem. Co, Newark, N J
Sherwin-Williams Co, Cleveland

ORANGE CRYSTALS
National Aniline & Chemical Co., Inc., New York 1159

ORANGE MINERAL
Eagle-Picher Lead Co., Chicago 1119
Matheson Lead Co, Long Island City, N Y

ORE CARS. See Cars, Ore

ORE CONCENTRATING EQUIPMENT. See specific headings

ORE FLOTATION PLANTS. See Flotation Machines

ORE ROASTING PLANTS
Herreshoff Furnace Dept., General Chemical Co., New York . 555
Pacific Foundry Co. (Herreshoff Furnace Dept.), San Fran 555
Perry & Webster, Inc., New York 760-761
Denver Fire Clay Co, Denver, Colo

ORES, RARE
Crosthwaite, Ralph L., Co., New York 1112
Johnson, Matthey & Co., New York 613
Amer. Metal Co., New York

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Amer. Smelt. & Ref. Co., New York
Atkins, Kroll & Co, San Fran.
Foote Mineral Co, Phila
Jefferson Tungsten Co, Hoboken, N J
Lavino, E J, & Co, Phila
Leavitt, C W, & Co, New York
Ward's Natural Sci Estab, Rochester
Willmarth, O Barlow, Montreal, Colo

ORPHOL. See Bismuth-beta-Naphthol

ORSAT GAS APPARATUS
Brooklyn Thermometer Co., Brooklyn, N Y 368
Claflin, Geo. L., Co., Providence 405
Daigger, A., & Co., Chicago 428
Eimer & Amend, New York 457
Glass Specialty Co., Newark, N J 523
Griebel Instrument Co., Carbondale, Pa 537
Marshall Rieha, Inc., Baltimore 692
Palo Company, New York 749
Precision Instrument Co., Newark N J 782-783
Rovey Instrument & Chemical Co., Buffalo 814
Scientific Utilities Co., New York 826-827
Standard Scientific Co., New York 852
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Will Corporation, Rochester 972-1066

ORRIS ROOT, WHOLE AND POWDERED
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ORTHO-ANISIDINE. See Anisidine, Ortho-

ORTHO-CHLORO-PARA-TOLUENE SODIUM SULPONATE. See Chloro-para-toluene sodium sulfonate, Ortho-

ORTHO-CRESOL. See Cresol, Ortho-

ORTHO-DICHLOROBENZENE. See Dichlorobenzene, Ortho-

ORTHO-NITRANILINE. See Nitraniline Ortho-

ORTHO-NITROCHLOROBENZENE. See Nitrochlorobenzene Ortho-

ORTHO-NITRO-PARA-TOLUIDINE. See Nitro para-toluidine, Ortho-

ORTHO-NITROPHENOL. See Nitrophenol, Ortho-

ORTHO-NITROTOLUENE. See Nitrotoluene, Ortho-

ORTHO-NITROTOLUIDINE. See Nitrotoluidine, Ortho-

ORTHO-TOLIDINE. See Tolidine, Ortho-

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ORTOL
Sagamore Chem Co, New York

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Bishop, J., & Co., Platinum Works, Malvern, Pa. 356
Johnson, Matthey & Co., New York 613
Roessler & Hasslacher Chemical Co., New York 1178-1179
Synthetical Laboratories of Chicago, Chicago 1191
Foote Mineral Co, Phila.

OSSEIN
Coignet Chem Prod. Co, New York
Wilckes-Martin-Wilckes Co, New York

OVEN TRUCKS
Drying Systems, Inc., Chicago 448-449
General Electric Co., Schenectady 508-517
Jeffrey Manufacturing Co., Columbus, O 606-607
Philadelphia Drying Machinery Co., Philadelphia 763
Proctor & Schwartz, Inc., Philadelphia 787
Westinghouse Electric & Mfg. Co., East Pittsburgh 946-961

OVENS, BAKING
Baker Sons & Perkins Co., Jos., White Plains, N Y 333
Beckley Perforating Co., Garwood, N. J. 345
Detroit Heating & Lighting Co., Detroit 433
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Koven, L. O., & Brother, Jersey City 651
Welded Steel Barrel Corpn., Detroit 433
Werner & Pfleiderer Co., White Plains, N Y 942-943
Westinghouse Electric & Mfg. Co., East Pittsburgh 946-961

OVENS, BAKING, VACUUM
Baker Sons & Perkins Co., Jos., White Plains, N Y 333
Buffalo Foundry & Machine Co., Buffalo 374-379
General Electric Co., Schenectady 508-517
Werner & Pfleiderer Co., White Plains, N Y 942-943
Westinghouse Electric & Mfg. Co., East Pittsburgh 946-961

OVENS, BREAD. See Ovens, Baking

OVENS, CHARCOAL, BY-PRODUCT. See Ovens, Wood Distillation

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OVENS, CONDITIONING. See Ovens, Laboratory

OVENS, CORE
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Detroit Heating & Lighting Co., Detroit 433
Drying Systems, Inc., Chicago 448-449
General Electric Co., Schenectady 508-517
Koven, L. O., & Brother, Jersey City 651
Surface Combustion Co., New York 874-875
Welded Steel Barrel Corpn., Detroit 433
Werner & Pfleiderer Co., White Plains, N Y 942-943
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Coatesville Boiler Works, Coatesville, Pa 408
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Fleisher, W. L., & Co., Inc., New York 480-481
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Koven, L. O., & Brother, Jersey City 651
Kutztown Foundry & Machine Co., Philadelphia 652-653
Philadelphia Drying Machinery Co., Philadelphia 763
Proctor & Schwartz, Inc., Philadelphia 787
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OVENS, ELECTRIC, INDUSTRIAL
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General Electric Co., Schenectady 508-517
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Koven, L. O., & Brother, Jersey City 651
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Marshall Rieha, Inc., Baltimore 692
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General Electric Co., Schenectady 508-517
Glass Specialty Co., Newark, N J 523
Hoskins Manufacturing Co., Detroit 574-575
Marshall Rieha, Inc., Baltimore 692
Mine & Smelter Supply Co., New York 704-705
Palo Company, New York 749
Rovey Instrument & Chemical Co., Buffalo 814
Scientific Utilities Co., Inc., New York 826-827
Standard Scientific Co., New York 852
Westinghouse Electric & Mfg. Co., East Pittsburgh 946-961
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OVENS, LACQUERING. See Ovens, Baking

OVENS, PARAFFIN
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OVENS, ROTARY
Famous Oven Mfg Co, New York
Crandall Pettee Co, New York

OVENS, TEXTILE, CONDITIONING
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OVENS, "THELCO"
Will Corporation, Rochester 972-1066
Thermo Elec Inst Co, Newark, N J

OVENS, VACUUM, "FREAS"
Will Corporation, Rochester 972-1066
Thermo Elec Inst Co, Newark, N J

OVENS, WOOD DISTILLATION
Badger, E. B., & Sons Co., Boston 310-329
Lummus, Walter E., Co., Boston 674-681
Mantius Engineering Co., New York 688-689
Struthers-Wells Co., Warren, Pa 864-865

OXAMINE VIOLET BLUE
Univ Aniline Dyes & Chem. Co, Milwaukee

OX-GALL
Wilson & Co., Chicago 1211

"OXIMONY"
Waldo, E. M. & F., New York 1208

OXI-TAN
Klipstein, A., & Co., New York 1143

"OXONE"
Roessler & Hasslacher Chemical Co., New York 1178-1179

OXY-ACETYLENE CUTTING AND WELDING APPARATUS
Electrolabs Company, Pittsburgh 461
International Oxygen Co., Newark, N J 597
Wilson Welder & Metals Co., Brooklyn 1067
Air Reduc Sales Co, New York
Burdett Mfg Co, Chicago
Linde Air Prod Co, New York
Oxweld Acetylene Co, Newark
Prest-O-Lite Co, Indianapolis

OXY-HYDROGEN APPARATUS
Electrolabs Company, Pittsburgh 461
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OXYGEN
Electrolabs Company, Pittsburgh 461
International Oxygen Co., Newark, N J 597
Air Reduc. Sales Co., New York
Amer Cotton Oil Co, New York
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Bird-Wilcox Company, Atlanta, Ga.
Burdett Mfg Co, Chicago
Clarke Chem Co, Wickliffe, O.
Dom Oxygen Co, Toronto
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K-G Welding & Cutting Co, New York
Lennox Chem Co, New York
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O. Chem & Mfg. Co, Cleveland
Oxygen Gas Co, Kansas City
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Standard Oxygen Co, New York
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- **Electrolabs Company,** Pittsburgh 461
- **International Oxygen Co.,** Newark, N J 597
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- **Lamson, John S., & Bro.,** New York 1146
- **Union Chemical Co.,** Boston 1198
- Amer Chem & Ozokerite Co, Chicago
- Chrystal, Chas B, New York
- Hachmeister - Lind Chem. Co, Pittsburgh
- Morningstar, B F, New York
- Salomon, L A, & Bro, New York
- Smith & Nichols, New York

OZONATORS
- **Sprague Electric Works,** New York 847

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- **General Electric Co.,** Schenectady 508-517
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PACCO DYESTUFFS
- Palatin Aniline & Chem Corpn, Boston

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- **Abbé, Paul O., Inc.,** New York 241-245
- **American Machinery Co.,** Philadelphia 272
- **Day, J. H., Co.,** Cincinnati 431
- **Pneumatic Scale Corpn.,** Norfolk Downs, Mass 770-771
- **Robinson Mfg. Co.,** Muncy, Pa 809
- Automatic Weighing Machine Co, Newark, N. J

PACKAGE LABELLING MACHINES
- **Pneumatic Scale Corpn.,** Norfolk Downs, Mass 770-771

PACKING MACHINES, CARTONS AND CANS
- **Pneumatic Scale Corpn.,** Norfolk Downs, Mass. 770-771

PACKERS, FLOUR, BRAN, ETC.
- **Sprout, Waldron & Co.,** Muncy, Pa 848

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- **Allbright-Nell Co.,** Chicago 260
- **American Process Company,** New York 276
- **Corbett, Geo. E., Boiler & Tank Co.,** Chicago 416
- **Dopp, H. W., Co.,** Buffalo 840-843
- **Elyria Enameled Products Company,** Elyria, Ohio 466
- **Jeffrey Manufacturing Co.,** Columbus, O 606-607
- **Link-Belt Company,** Chicago 667
- **Sowers Mfg. Co.,** Buffalo 840-843
- **Weller Mfg. Co.,** Chicago 941

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PACKING MATERIAL, CORRUGATED FIBER
- **Hinde & Dauch Paper Co.,** Sandusky, O. 561

PACKINGS, ACID-PROOF
- **American Huhn Metallic Packing Co.,** New York 270
- **Belmont Packing & Rubber Co.,** Philadelphia 346
- **Goetze Gasket & Packing Co.,** New Brunswick, N J. 527
- **Jenkins Bros.,** New York 608-611
- **Keasbey & Mattison Co.,** Ambler, Pa. 619
- **Manhattan Rubber Mfg. Co.,** Passaic, N. J 690
- **New York Belting & Packing Co.,** New York 725
- **Norristown Magnesia & Asbestos Co.,** Norristown, Pa 730
- **United States Rubber Co.,** New York 918-919

PACKINGS, AMMONIA
- **American Huhn Metallic Packing Co.,** New York 270
- **Belmont Packing & Rubber Co.,** Philadelphia 346
- **Goetze Gasket & Packing Co.,** New Brunswick, N J 527
- **Janos Asbestos Co.,** New York 604
- **Jenkins Bros.,** New York 608-611
- **Keasbey & Mattison Co.,** Ambler, Pa 619
- **Manhattan Rubber Mfg. Co.,** Passaic, N J 690
- **New York Belting & Packing Co.,** New York 725
- **Norristown Magnesia & Asbestos Co.,** Norristown, Pa. 730
- **United States Rubber Co.,** New York 918-919
- **Vilter Manufacturing Co.,** Milwaukee 924

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- **Belmont Packing & Rubber Co.,** Philadelphia 346
- **Goetze Gasket & Packing Co.,** New Brunswick, N J 527
- **Janos Asbestos Co.,** New York 604
- **Keasbey & Mattison Co.,** Ambler, Pa 619
- **Norristown Magnesia & Asbestos Co.,** Norristown, Pa 730

PACKINGS, AUTOCLAVE
- **American Huhn Metallic Packing Co.,** New York 270
- **Goetze Gasket & Packing Co.,** New Brunswick, N J 527

PACKINGS, "BELMONT"
- **Belmont Packing & Rubber Co.,** Philadelphia 346

PACKINGS, CARBON DIOXIDE
- **American Huhn Metallic Packing Co.,** New York 270
- **Goetze Gasket & Packing Co.,** New Brunswick, N J 527

PACKINGS, CHLORINE
- **American Huhn Metallic Packing Co.,** New York 270
- **Goetze Gasket & Packing Co.,** New Brunswick, N J 527

PACKINGS, CONDENSER
- **Goetze Gasket & Packing Co.,** New Brunswick, N J. 527
- **Wheeler Condenser & Eng. Co.,** Carteret, N J 963

PACKINGS, FLAX
- **Janos Asbestos Co.,** New York 604
- Simmons, John, Co, New York

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- **Diamond State Fibre Co.,** Bridgeport, Pa. 435

PACKINGS, "GOETZE"
- **Goetze Gasket & Packing Co.,** New Brunswick, N J 527

PACKINGS, HIGH PRESSURE
- **American Huhn Metallic Packing Co.,** New York 270
- **Belmont Packing & Rubber Co.,** Philadelphia 346
- **Goetze Gasket & Packing Co.,** New Brunswick, N J 527
- **Janos Asbestos Co.,** New York 604
- **Jenkins Bros.,** New York 608-611
- **Manhattan Rubber Mfg. Co.,** Passaic, N J 690
- **New York Belting & Packing Co.,** New York 725
- **Norristown Magnesia & Asbestos Co.,** Norristown, Pa 730
- **Sarco Co., Inc.,** New York 819
- **United States Rubber Co.,** New York 918-919
- **Wood, R. D., & Co.,** Philadelphia 1070-1071

PACKINGS, HYDRAULIC
- **American Huhn Metallic Packing Co.,** New York 270
- **Belmont Packing & Rubber Co.,** Philadelphia 346
- **Goetze Gasket & Packing Co.,** New Brunswick, N J 527
- **Janos Asbestos Co.,** New York 604
- **Jenkins Bros.,** New York 608-611
- **Keasbey & Mattison Co.,** Ambler, Pa 619
- **Manhattan Rubber Mfg. Co.,** Passaic, N. J. 690
- **New York Belting & Packing Co.,** New York 725
- **Norristown Magnesia & Asbestos Co.,** Norristown, Pa 730
- **United States Rubber Co.,** New York 918-919
- **Van Atta, E. B., & Company, Inc.,** Olean N Y 922
- **Watson-Stillman Co.,** New York 939
- **Wood, R. D., & Co.,** Philadelphia 1070-1071

PACKINGS, LEATHER
- **Belmont Packing & Rubber Co.,** Philadelphia 346
- **Goetze Gasket & Packing Co.,** New Brunswick, N J 527
- **Wood, R. D., & Co.,** Philadelphia 1070-1071
- Alexander Bros, Phila
- Chicago Belting Co, Chicago
- Houghton, E F, & Co, Phila
- Ladew, Edw. R., Co, Inc, New York

PACKINGS, KETTLE, CHEMICAL
- **American Huhn Metallic Packing Co.,** New York 270
- **Goetze Gasket & Packing Co.,** New Brunswick, N. J. 527

PACKINGS, METALLIC
- **American Huhn Metallic Packing Co.,** New York 270
- **Belmont Packing & Rubber Co.,** Philadelphia 346
- **Goetze Gasket & Packing Co.,** New Brunswick, N. J 527
- **Sarco Co., Inc.,** New York 819
- **Wood, R. D., & Co.,** Philadelphia 1070-1071
- Ajax Metal Co, Phila.
- Akron Metallic Gasket Co, Akron

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- • Flexitallic Gasket Co., Camden, N. J.
- Simmons, John, Co., New York
- Steel Mill Packing Co, Detroit

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- **Belmont Packing & Rubber Co.,** Philadelphia 346

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- **American Huhn Metallic Packing Co.,** New York 270
- **Belmont Packing & Rubber Co.,** Philadelphia 346
- **Goetze Gasket & Packing Co.,** New Brunswick, N J 527
- **Janos Asbestos Co.,** New York 604
- **New York Belting & Packing Co.,** New York 725
- **Norristown Magnesia & Asbestos Co.,** Norristown, Pa 730
- **Sarco Co., Inc.,** New York 819

PACKINGS, ROD
- **American Huhn Metallic Packing Co.,** New York 270
- **Belmont Packing & Rubber Co.,** Philadelphia 346
- **Goetze Gasket & Packing Co.,** New Brunswick, N J 527
- **Janos Asbestos Co.,** New York 604
- **New York Belting & Packing Co.,** New York 725
- **Norristown Magnesia & Asbestos Co.,** Norristown, Pa 730
- **Sarco Co., Inc.,** New York 819
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PACKINGS, RUBBER
- **Belmont Packing & Rubber Co.,** Philadelphia 346
- **Janos Asbestos Co.,** New York 604
- **Jenkins Bros.,** New York 608-611
- **Manhattan Rubber Mfg. Co.,** Passaic, N J 690
- **New York Belting & Packing Co.,** New York 725
- **Norristown Magnesia & Asbestos Co.,** Norristown, Pa 730
- **United States Rubber Co.,** New York 918-919
- General Asbestos & Rubber Co, Charleston, S C
- Mikesell Bros Co, Chicago
- Simmons, John, Co, New York

PACKINGS, SHEET
- **Belmont Packing & Rubber Co.,** Philadelphia 346
- **Goetze Gasket & Packing Co.,** New Brunswick, N J 527
- **Janos Asbestos Co.,** New York 604
- **Jenkins Bros.,** New York 608-611
- **New York Belting & Packing Co.,** New York 725
- **Norristown Magnesia & Asbestos Co.,** Norristown, Pa 730
- **Sarco Co., Inc.,** New York 819

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- **Goetze Gasket & Packing Co.,** New Brunswick, N J 527

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- **Duriron Company,** Dayton, O. 450-453

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- Genesee Chem. Co, Batavia, N. Y.

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- **Eclipse Air Brush Co.,** Newark, N J 456
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- **Eclipse Air Brush Co.,** Newark, N J 456
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- **Bartlett, C. O., & Snow Co.,** Cleveland 338
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- **Kent Machine Works,** Brooklyn, N. Y. 629
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- **Barber Asphalt Paving Co.,** Philadelphia 1098
- **General Bakelite Co.,** New York 502
- **Horn, A. C., Company,** Long Island City, N Y. 578
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Import Chem Co, Jersey City
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Port Morris Chem. Wks, New York
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Natl Oil Prod Co, Harrison, N J
New Brunswick Chem. Co., New Brunswick, N J
Onyx Oil & Chem Co, Jersey City
Quaker City Chem Co, Phila.
Royal Chem Co, Harris, R I
Seydel Mfg Co, Jersey City
Sizing Specialties Co, Jersey City
Trojan Textile Chem Co, New York
United Chem Prod Corpn, Jersey City
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More-Jones Brass & Metal Co, St Louis
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Richard & Co, Boston
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- ◆ **Walter, Theo. C., Jr.**, Newark, N. J 933

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- **American Hard Rubber Co.**, New York 268-269

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Chuctamunda Gas Light Co, Amsterdam N. Y
Citizens Gas Co., Indianapolis
City Gas Co, Norfolk, Va
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Corrigan, McKinney & Co., Cleveland
Decatur Ry. & Light Co, Decatur, Ill
Derby Gas Co, Derby, Conn
Des Moines Gas Co, Des Moines
Detroit City Gas Co, Detroit
Dom Iron & Steel Co, Sydney, N. S
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Dom. Tar & Chem Co, Sault Ste Marie, Ont
Dover By-Prod Coke Co, Dover, Ohio
El Paso Gas Co, El Paso, Tex
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Elizabethtown Gas Light Co., Elizabeth, N J.
El Paso Gas Co., El Paso, Tex
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Jacksonville Gas Co, Jacksonville, Fla
Key City Gas Co, Dubuque, Ia
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- **Crane Co.**, Chicago 420-421
- **Davis, G. M., Regulator Co., Inc.**, Chicago 430
- **Eynon-Evans Mfg. Co.**, Philadelphia 472
- **Grinnell Company, Inc.**, Providence 532-536
- **Jenkins Bros.**, New York 608-611
- **Kelly & Jones Co.**, Greensburg, Pa 624-625
- **Monarch Mfg. Works, Inc.**, Philadelphia 706
- **Pittsburgh Valve, Foundry & Construction Co.**, Pittsburgh 766-768
- **Pratt & Cady Division**, Hartford 798-799
- **Reading Valve & Fittings Co.**, Reading, Pa 798-799
- **Schutte & Koerting Co.**, Philadelphia 822-823

VALVES, NON-RETURN, AUTOMATIC

- **Pratt & Cady Division**, Hartford 798-799
- **Reading Valve & Fittings Co.**, Reading, Pa .798-799

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- **American Car & Foundry Co.**, New York 264
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- **Pittsburgh Valve, Foundry & Construction Co.**, Pittsburgh 766-768
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- **Vogt, Henry, Machine Co.**, Louisville 926-927

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- **American Foundry & Construction Co.**, Pittsburgh 266-267
- **Chemical Equipment Co.**, Chicago 394-395
- **Davis, G. M., Regulator Co., Inc.**, Chicago 430
- **Dougherty, M. J., Co.**, Philadelphia 412-443
- **Grinnell Company, Inc.**, Providence 532-536
- **Jenkins Bros.**, New York 608-611
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- **Kennedy Valve Mfg. Co.**, Elmira, N Y 628
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- **Schutte & Koerting Co.**, Philadelphia 822-823
- **Watson-Stillman Co.**, New York 939
- **Wood, R. D., & Co.**, Philadelphia 1070-1071

VALVES, PACKLESS

- **Chemical Pump & Valve Co.**, Perth Amboy, N. J. 396
- **Fulton Company**, Knoxville 494

VALVES, PISTON

- **Pittsburgh Valve, Foundry & Construction Co.**, Pittsburgh 766-768
- **Provost Engineering Corpn.**, New York 788

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- **American Foundry & Construction Co.**, Pittsburgh 266-267
- **Merrill Company**, San Francisco 699
- **Pittsburgh Valve, Foundry & Construction Co.**, Pittsburgh ..766-768
- **Pratt & Cady Division**, Hartford .798-799
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VALVES, PLUG, "MERCO NORDSTROM"

- **Merrill Company**, San Francisco... 699

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VALVES, PUMP
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Keasbey & Mattison Co., Ambler, Pa. 619
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VALVES, PUMP CONTROLLING
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Smith Chemical & Color Co., New York 1190
Buchanan, C G, Chem Co, Cincinnati
Citro Chem Co, Maywood, N J
Fulton Chem Wks, Bklyn
Keystone Dyestuff & Chem Co, Newark N J
Merck & Co New Yerk
Natl Oil Prod Co, Harrison, N J
Sargent Chas R, Co, Cleveland
Seydel Mfg Co, Jersey City
Sloan & Russell New York
Smith Kline & French Co Phila
Stearyte Co, Yonkers N Y
Stresen-Reuter & Biser Chicago
Van Dyk L A, New York

ZINC SULFATE
Butterworth-Judson Corpn., New York 1102
Chaplain & Bibbo New York 1106
Cooper, Chas. & Co., New York 1111
General Chemical Co, New York 1124
Grasselli Chemical Co., Cleveland 1125
Harshaw Fuller & Goodwin Co., Cleveland 1127
Klipstein, A., & Co., New York 1143
Metals & Chemicals Extraction Corpn., San Francisco 1153
Powers - Weightman - Rosengarten Co., Philadelphia 1172
Roessler & Hasslacher Chemical Co., New York 1178-1179
Smith Chemical & Color Co., New York 1190
Agawam Chem Wks, Providence
Amer Metal Co, New York
Amer Smelt & Ref Co, Salt Lake City
Amer Zinc & Chem Co, Pittsburgh
Avery Chem Co, Boston
Barada, Gordon & Page, Kansas City
Central Chem Co, Chicago
Cons Chem Prod Co Alton Ill
Cowan John, Chem Co Montreal
Crown Chem Co Pittsburgh
Donnelly Chem Co, Newark, N J
Gt Amer Chem Prod Co, New York
Greeff, R W, & Co, New York
Innis, Speiden & Co, New York

PAGE

ZINC SULFATE—Con.
Merck & Co., New York
Midland Chem Co, Chicago
Mineral Ref & Chem. Corpn., St Louis
Munning-Loeb Co, Matawan, N J
Stresen-Reuter & Biser, Chicago
Synthetic Chem Wks, Phila.
Tennessee Copper Co, Copperhill, Tenn
Whittaker, Clark & Daniels, New York
Wiarda, John C, & Co, Bklyn

ZINC SULFATE, C. P. "BAKER'S ANALYZED"
Baker, J. T., Chemical Co., Phillipsburg, N J 1095

ZINC SULFIDE
Buchanan C G, Chem Co, Cincinnati
Genl Metallic Oxides Co, Jersey City
Midland Chem Co, Chicago
Whittaker, Clark & Daniels, New York

ZINC SULFITE
N J Zinc Co, New York

ZINC SULFOCARBOLATE
Albany Chemical Company, Albany, N Y 1087
Merck & Co

ZINC TRISALYT
Roessler & Hasslacher Chemical Co., New York 1178-1179

ZINC TUNGOLEATE
Klipstein, A., & Co., New York . 1143

ZINC VALERIATE
Hartland Chem Co, New York
Hercules Powder Co, Wilmington
Orr Chem Co Newark, N J.

ZINC WHITE. See Zinc Oxide

ZINCS, BATTERY
Grasselli Chemical Co., Cleveland. 1125

ZIRCONIA ORES
Foote Mineral Co, Phila
Lavino, E J, & Co, Phila

ZIRCONIUM
National Sales Co., Cincinnati . .. 1161
Foote Mineral Co, Phila

ZIRCONIUM ACETATE
Welsbach Company, Gloucester, N J 1210

ZIRCONIUM CHLORIDE
Foote Mineral Co, Phila

ZIRCONIUM-FERRO-SILICON
Foote Mineral Co, Phila

ZIRCONIUM HYDRATE
Welsbach Company, Gloucester, N J . 1210

ZIRCONIUM METAL
Foote Mineral Co Phila.

ZIRCONIUM NITRATE
Welsbach Company, Gloucester, N J 1210

ZIRCONIUM OXIDE
Roessler & Hasslacher Chemical Co., New York 1178-1179
Welsbach Company, Gloucester, N. J 1210
Foote Mineral Co, Phila

ZIRCONIUM SILICATE
Foote Mineral Co, Phila

"ZIRKITE" BRICK AND CEMENT
Foote Mineral Co, Phila

"ZIRKONALBA" REFRACTORIES
Foote Mineral Co, Phila.

PAUL O. ABBÉ INC.

Crushing, Cutting, Grinding, Mixing, Pulverizing and Sifting Machinery

New St. and Exchange Pl.
JOHNSTON BUILDING, NEW YORK, N. Y.

OPTIMUM PEBBLE MILL ABBÉ
Trade Mark

PRODUCTS

Attrition Mills, Assay Mills, Ball Mills, Bolting Reels, Cage Mills, Compressors, Crushers, Cutters, Disintegrators, Dufour Bolting Cloth, Goggles (acid and dust proof), Hammer Mills, Jar Mills, Knife Grinders, Mixers, Pebble Mills, Pressure Blowers, Respirators, Roller Mills, Sifters, Specimen Mills, Vacuum Pumps.

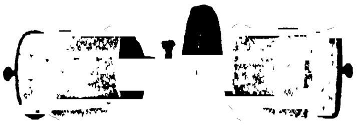
DISTINGUISHING MARK

Our equipment is distinguished by this well known black and white mark.

PAUL O. ABBÉ

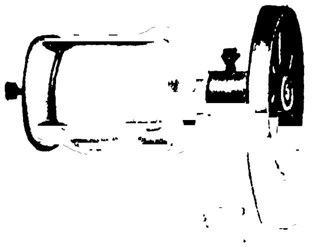
JAR MILLS

The Jars are made from the very highest grade of Porcelain and will last for years. They are substantially fastened, none of them being held in position by rubber bands.



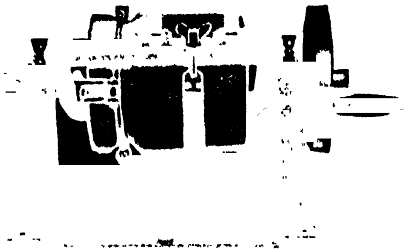
DOUBLE SPECIMEN MILL. PRICE, $36.50

Mills built with either 1, 2 or 5 Jars
Specimen Jar measures, outside 5 2 x 5 71 inches
Capacity, ¼ oz to 1½ lbs. at a charge, dry (Sand as unit)
Capacity, ¼ gallon, wet



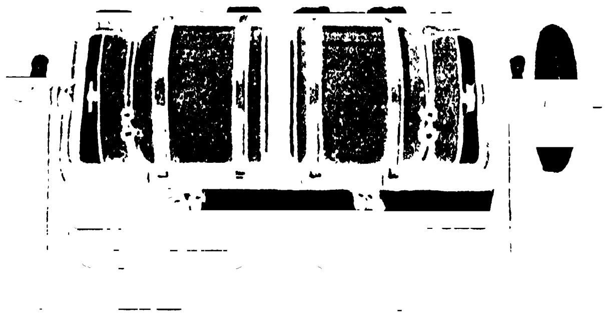
SINGLE BACILLI MILL. PRICE, $28.50

Mills built with 1, 2 or 5 Jars.
The Bacilli Jar is of special form inside, so it can be used for Tubercle Bacilli, etc
Bacilli Jar measures, outside, 5.75 x 6.5 inches.
Capacity, ¼ oz. to 2 lbs. at a charge. (Sand as unit.)
Capacity, 1/3 gallon, wet.

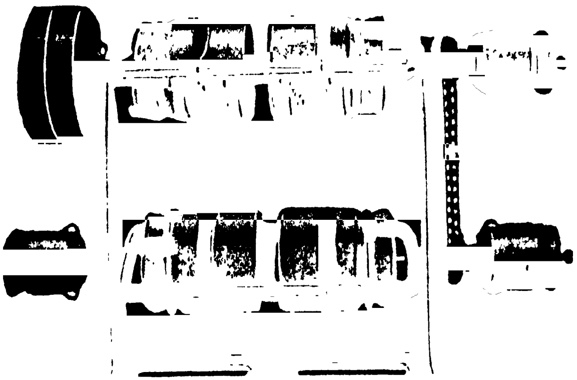


TYPE "A" SINGLE ASSAY MILL. PRICE, $55.00

Mills built with either 1, 2, 3, 4, 6, 8, 9 or 12 Jars.
Assay Jar measures, outside, 8 75 x 9 65 inches
Capacity, 1 oz to 5 lbs at a charge, dry. (Sand as unit.)
Capacity, 1 gallon, wet.



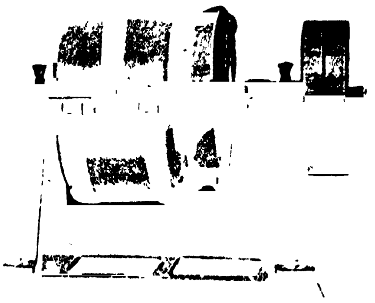
TYPE "A" DOUBLE ASSAY MILL. PRICE, $82.50



TYPE "D" QUADRUPLE ASSAY MILL WITH SPECIMEN JARS (3). PRICE, $180.00

The above illustration shows one of many different mills combining several sizes of jars.

Continued on Next Page

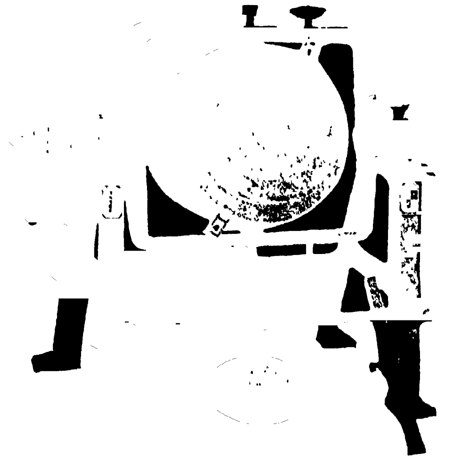


SINGLE NO. 0 JAR MILL. PRICE, $82.50

Mills built with 1, 2 or 4 Jars
No 0 Jar measures, outside, 12 5 x 9 6 inches
Capacity, ½ to 10 lbs at a charge. (Sand as unit.)
Capacity, 2 gallons, wet.

SINGLE NO. 1 JAR MILL. PRICE, $107.50

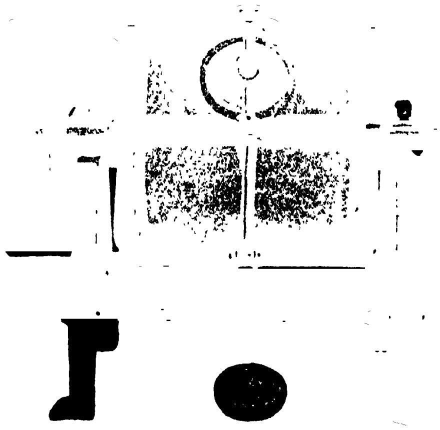
Mills built with either 1, 2 or 4 Jars
No. 1 Jar measures, outside, 13 x 12 5 inches.
Capacity, 1 to 15 lbs at a charge (Sand as unit)
Capacity, 4 gallons, wet.



NO. 2 JAR MILL, OPEN. PRICE, $192.50

No. 2 Jar measures, outside, 14 75 x 16.5".
Capacity, 5 to 25 lbs. at a charge. (Sand as unit.)
Capacity, 6.6 gallons, wet.

The illustration below shows the type of construction used in building No. 3, No. 4 and No. 5 Jar Mills.



No. 3 JAR MILL. PRICE, $220.00
No. 4 " " " 250.00
No. 5 " " " 305.00

No 3 Jar measures, outside, 17 72 x 10".
Capacity, 10 to 30 lbs at a charge (Sand as unit.)
Capacity, 7 66 gallons, wet
No 4 Jar measures, outside, 17 72 x 18 70"
Capacity, 20 to 60 lbs at a charge (Sand as unit.)
Capacity, 15 59 gallons, wet
No 5 Jar measures, outside, 22 5 x 19".
Capacity, 25 to 80 lbs at a charge. (Sand as unit.)
Capacity, 23 78 gallons, wet

PAUL O. ABBÉ JARS

Paul O. Abbé Jars are of Standard form, as used for many years, and will be supplied with Neckbands, Crossbars, Gaskets, Pebbles, etc., from stock.

In some supply catalogs these are listed as Ball Mills.

JAR SIZES

5 2 x 5 71 in.	5 75 x 6.5 in.	8 75 x 9 65 in.	12 5 x 9 6 in.	13 0 x 12 5 in.	14.75 x 16 5 in.

PORCELAIN BALLS, METAL BALLS OR SLUGS

Porcelain Balls, Metal Balls or Slugs will be furnished with our Jar and Pebble Mills to meet special conditions when wanted, instead of the Hand Selected Flint Pebbles, but at extra cost.

CATALOGS

We issue 5 catalogs:
"A"—Ball or Pebble Mills.
"B"—Crushers, Cutters, Grinders, Sifters, etc.
"C"—Mixers and Sifters.
"D"—Jar Mills.
"E"—Mead Mills.
Also Booklets regarding Dufour Bolting Cloth.

Continued on Next Page

PEBBLE MILLS

Designed mechanically correct, substantially built of first-class materials throughout. These machines, as well as the Jar Mills, grind and mix dry or wet.

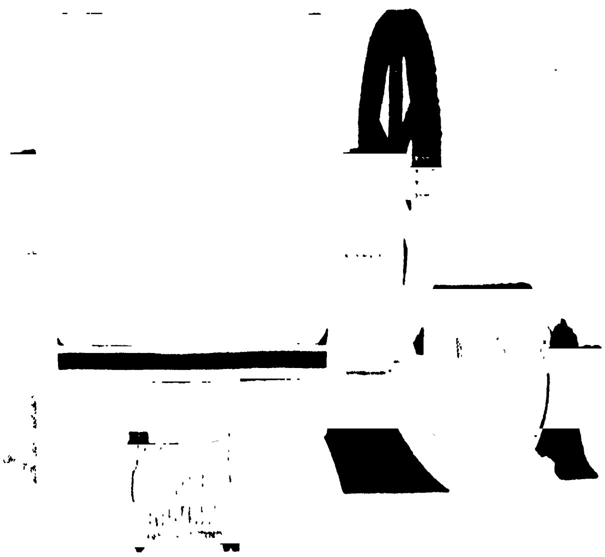
These Mills have no contaminating surfaces, create no dust in the working room, cause no loss of material, and reduce all of the product. Produce a uniform finished material, run for years without repairs, are always adjusted and require no dressing, need no attention while operating. Save in power, labor, space and time, no skilled labor required.

NO. 6 PEBBLE MILL. PRICE, $390.00
Cylinder, 30" diameter x 33½" long

PEBBLE MILLS—LIST OF SIZES, ETC.

No. of Mill	Diameter of Cylinder	Length of Cylinder	Capacity each charge taking sand as unit Lbs.	Holds in gallons inside of lining	Floor space required	Height	Size of Pulleys	Diameter of Gear Wheel	Amount of Pebbles supplied Lbs.	H. P. Dry	H. P. Wet	Shipping Weight Lbs.	Speed of Cylinder R.P.M.
0	6'	8'	4000	1297	15' x 10'	9' 6"	36"x12"	6' 8"	8,300	20	15	26,000	13-18
1B	6'	7'	3600	1114	14' x 10'	9' 6"	36"x12"	6' 8"	7,200	17	13	24,000	13-18
1A	6'	6'	3200	931	13'6" x 10'	9' 6"	36"x10"	6' 8"	6,100	15	11	22,000	13-18
1	6'	5'	2800	748	13' x 10'	9' 6"	30"x10"	6' 8"	5,000	13	10	20 000	13-18
2A	5'	6'	2200	632	12'6" x 7'	8'	28"x10"	5' 3"	4,070	10	7	17,500	18-25
2	5'	4'	1500	390	10'6" x 7'	8'	28"x 8"	5' 3"	2,750	8	6	14,750	18-25
3C	4' 6"	5'	1550	408	10'6" x 6'	7'	24"x 8"	5'	2,800	8	6	15,000	25-30
3B	4' 6"	4' 6"	1150	360	10' x 6'	7'	24"x 8"	5'	2,500	7	5	12,700	25-30
3A	4' 6"	4'	950	310	9'6" x 6'	7'	24"x 6"	5'	2,320	6	4	10,500	25-30
3	4' 6"	3' 6"	800	262	9' x 6'	7'	24"x 6"	5'	2,100	5	3½	8,200	25-30
4	3' 9"	3' 6"	500	160	7'6" x 6'	6' 4"	45"x 6"		1,160	4	3	5,509	28-35
5A	3'	4'	350	125	7'3" x 4'3"	6'	36"x 6"		880	2¼	2	4,800	35-40
5	3'	3' 6"	300	100	6'9" x 4'3"	6'	36"x 6"		770	2	1½	4 200	35-40
6	2' 6"	2' 9½"	200	60	5'6" x 3'9"	4' 9"	24"x 4"		440	1½	1	2,200	38-44
7	2' 6"	1' 10¾"	120	36	4'9" x 3'9"	4' 9"	24"x 4"		330	1	¾	1,900	38-44
8	1' 6"	2' 3"	50	16	3'9" x 2'3"	3' [illegible]	18"x 2"		125	½	⅓	900	40-50
9	1' 3"	1' 7"	23	7	3'2" x 2'3"	3' 6"	16"x 2"		60	¼	⅙	700	50-55

PEBBLE MILLS (Continued)



NO. 3 PEBBLE MILL. PRICE, $1210.00
Cylinder, 54" diameter x 42" long

USES FOR JAR AND PEBBLE MILLS

- Acetanilid
- Acid
- Aspirin
- Bacilli
- Barytes
- Bauxite
- Bone
- Calcined Lithia Crystals
- Carbon
- Carborundum
- Carmine
- Cement
- Charcoal
- Chemicals
- Citric Acid
- Coal
- Coke
- Colors
- Colors in Alcohol
- Colors in Oil
- Copper Paint
- Corundum
- Drugs
- Emery
- Enamels
- Face Powders
- Feldspar
- Fibrous Materials
- Flint
- Fret
- Fuller's Earth
- Glazes
- Guayule
- Guncotton
- Iron Turnings
- Lacquer (Metal and Wood)
- Lactated Food
- Lime
- Magnesium Oxide
- Marble
- Menthol
- Milk Powder
- Ores, etc.
- Paints
- Pepsin
- Plumbago
- Pumice Stone
- Pyrites
- Quartz
- Rotten Stone
- Rubber
- Shellac
- Silica
- Slate
- Soapstone
- Sugar of Milk
- Talc
- Tobacco
- Tungsten
- Zinc Blend

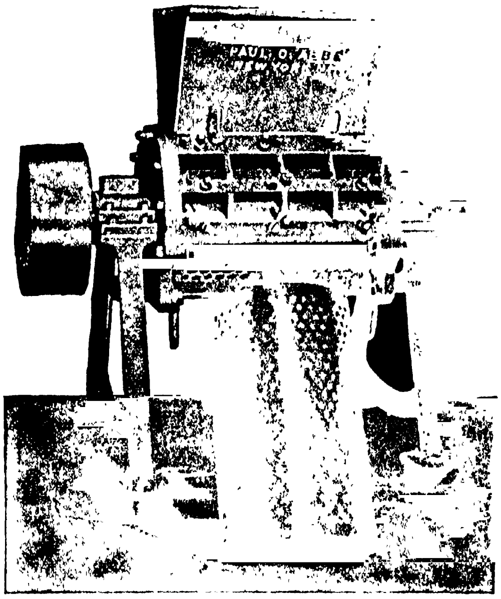
And a great variety of other materials too numerous to mention.

Paul O. Abbé Mills are the results of more than twenty-five years' actual experience in designing and building machinery operating on hundreds of different materials.

Continued on Next Page

IMPROVED ROTARY CUTTER

This machine has been on the market for 20 years, over 850 of them being in successful operation. It is built under United States patents, covering all the latest improvements.



NO. 1 ROTARY CUTTER (CLOSED)

Three screens furnished with each machine Illustration shows one of the extra two

USES FOR IMPROVED ROTARY CUTTER

The Improved Rotary Cutter is well adapted to the reduction of such materials as:

- Asbestos
- Asbestos Scrap
- Barks
- Boiler Covering
- Bones
- Bread
- Cardboard
- Celluloid
- Chick Food
- Chicory
- Chipped Log Wood
- Cork
- Drugs
- Grains of all kinds
- Guayule Shrub
- Hard Fiber
- Hard Rubber
- Herbs
- Leather
- Leaves
- Magarines
- Mustard
- Newspapers
- Oat Hulls
- Paper
- Paper Cones
- Pulp
- Rags
- Rechipper in Sulphite Mill
- Roots
- Rubber
- Sawdust
- Shavings
- Spices
- Spruce Wood Chips
- Spills
- Tobacco Stems
- Trading Stamps, Coupons and Books
- Vegetable Ivory
- Wood Blocks, etc.

The machine is so built that it will cut either the most delicate leaves or the hardest roots, such as:

Chinese Licorice Turmeric Soap Root
Nux Vomica, etc.

This machine is used in Boiler Covering Works, Bone and Tallow Plants, Chemical Works, Cork Works, Drug Mills, Feed and Flour Mills, Fertilizer Plant's, Grease and Soap Plants, Paper Mills, Rubber Regenerating Works, Spice Mills, Sulphite Mills, etc.

LIST OF SIZES, ETC.

No. of Machine	Floor Space Required	Shipping Weight, Lbs.	Size of Pulley	Speed R. P. M.	H P. Required	Size of Screen
No. 0	3'1" x 1' 5"	500	10 x 3"	900 to 1200	2 to 5	10 x 17"
No. 1	4'6" x 2'10"	1500	16 x 6"	600 to 900	5 to 15	20 x 24"
No. 1½	5'8" x 2' 6"	2150	18 x 8"	600 to 900	10 to 20	25⅞x24⅛"
No. 2	5'8" x 3' 6"	4000	20 x 6'	600 to 900	15 to 40	20¼x27⅛"
No. 2½	8' x 3' 3"	6000	20 x 9"	500 to 800	20 to 45	35 5/16x35⅞"
No. 3	8'6" x 3' 7"	12000	30 x 12"	500 to 750	30 to 60	50½x29½"

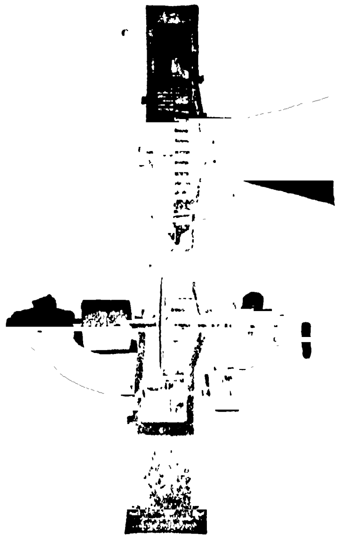
MEAD MILL

This mill is so well known and so universally used that mere mention of the fact that we are Sole Eastern Agents for this machine will suffice for the vast majority of the trade.

To those as yet unfamiliar with this type of machine, we would say that this is the drug mill of greatest general use, doing coarse and fine grinding as desired, and is especially the mill for granulation and percolation.

NO. 1 MILL

Handles such material as roots, barks, leaves, flowers, gums, resins, aloes, asphaltum, casein, chicle, cocoa, dried milk, rosin, shellac and sulphur, generally reducing or dividing them to from 30 to 100 Mesh fine.



OPENED TO SHOW DISC, SCREEN, BLANK AND CORRUGATED RINGS

This is the Mill for glue and gelatin, dry precipitates, chemical salts, phonograph discs, battery boxes, leather scraps and hundreds of other materials.

Capacity depends entirely upon the nature of the material to be ground, and our service is always at your disposal.

TABULAR INFORMATION ON MEAD MILLS

No. of Mill	H. P. Required	Speed R. P. M.	Size of Pulley	Weight
Pony	1	5000	3 x 2½"	150
1	5 to 6	3400	5 x 4½"	400
2	7½ to 9	2800	6 x 5½"	800
3	10 to 15	2300	8 x 7½"	1200

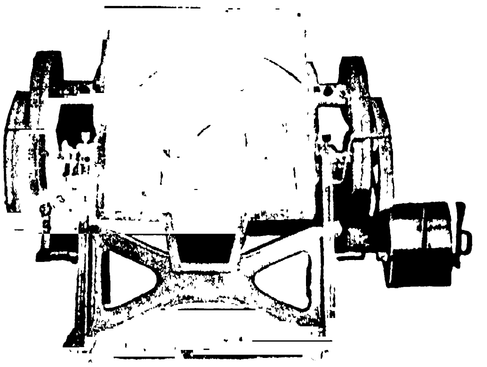
Continued on Next Page

HEAVY MASS KNEADER

Strong machines for heavy work such as Nitrocellulose Putty, Rubber, White Lead, etc.

Built with or without steam jacket.

Made in **Six Sizes.**



MASTODON MIXER

DISC GRINDER WITH BREAKER

The simplest and least expensive of all mills. Has one toothed or grooved disc revolving against a stationary disc. Made in several sizes.

DISC GRINDER

AUTOMATIC RUBBER RESPIRATORS

Automatic Rubber Respirator has a perfect filter device, and no sticking Valve Disc as is found in other respirators. It has large capacity and will keep out Dust, Smoke, Fumes and Gases and protects the exposed workman in any occupation. It is made of Soft White Rubber, is easily kept clean, and bends perfectly to fit any face. Many thousands are in use and old customers are continually ordering more. Price $24.00 per doz. On receipt of $2.25 one will be forwarded as a sample. Money refunded if not as represented.

BOLTING CLOTH

We constantly carry a large stock of this **material.** Usually shipped in six hours.

Cloths made up promptly and in the most perfect and workmanlike manner. Usual delivery one day after order.

Webbing furnished in place of ticking, if desired.

PRICE LIST FOR THE GENUINE
DUFOUR BOLTING CLOTH

Price per yard, 40 inches wide

Meshes per lineal inch	Number	Standard	Extra heavy X	Double Extra XX	Meshes per lineal inch	Number	Treble Extra XXX	Grit Gauze No. Equals	XXX Grit Gauze No. Equals
18	0000	$2 45	...	$2 95		..	...		
23	000	2 55	..	3 00	.	..	.....	16 0000	14 16
29	00	2 60	....	3 10		..	.....	18	16 18
38	0	2 65	...	3 20	...	..	.....	20,000	18 20
48	1	2 75	.	3 30		..	...	22	20 22
54	2	2 85	..	3 45	.	..	...	24	22 24
58	3	3 00	.	3 60		..	.....	26 00	24 26
62	4	3 10	.	3 80	.	..	....	28	26.28
66	5	3 20		3 95	.	..	.....	30	28 30
74	6	3 40	$3 75	4 10	71	6	$4 35	32	30.34
82	7	3 55	3 90	4 30	74	7	4 55	34 0	32 36
86	8	3 90	4 25	4 55	82	8	4 80	36	34 38
97	9	4 20	4 60	4 85	86	9	5 05	38	36 40
109	10	4 60	4 90	5 15	97	10	5 35	40	38 42
116	11	4 85	5 20	5 40	109	11	5 65	42	40 44
125	12	5 20	5 50	5 90	116	12	6 10	44 1	42 46
129	13	5 40	5 80	6 30	125	13	6 50	46	44 48
139	14	5.70	6 10	6 70	129	14	6 90	48	46 50
150	15	6 10	6 75	7 15	139	15	7.50	50 2	48 52
157	16	6 75	7 30	8 00	150	16	8 50	52	50 54
163	17	7.50	8 00	.	157	17	9 50	54 3	52 56
166	18	9 00			163	18	11 40	56	54 58
169	19	10 15	.			..	.....	58 4	56 60
173	20	11 20			..	..	.. .	60	58 62
178	21	12 00			..	..	.	62 5	60 64
200	25	14 00		.....	...	..	.....	64	62 66
								66 6	64 68
								68	66 70
								70 7	68.72
								72	70

Grit Gauze, all Nos $4 65
XXX Grit Gauze, all Nos, $5 75

Date of above list, August 1, 1921

RUBBER GOGGLES

Gas Tight Rubber Goggles are made of a single piece of Pure Rubber and are Waterproof and Sanitary. Many different sizes and shapes of lenses can be used which are replaceable in a moment and are held constrictively. Are fitted with mica lenses for firemen's use. Fit anybody. Air-tight. Protect the eyes against smoke. Used in many of the largest chemical and metallurgical plants in America. Price per dozen, $18.00. On receipt of $1.50 will send sample, postpaid.

JOHN F. ABERNETHY

Lead Burning

708-710 MYRTLE AVENUE, BROOKLYN, N. Y.

PRODUCTS

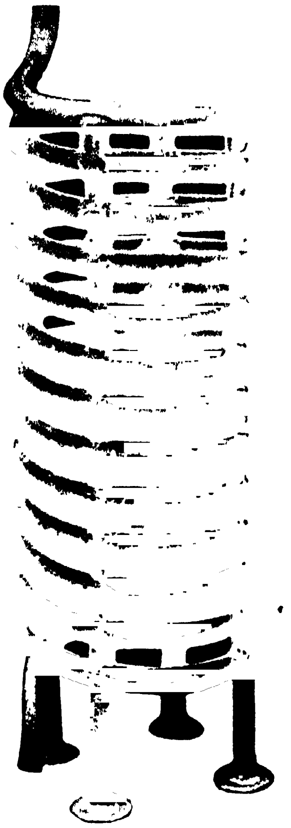
Lead Lined Tanks of all description; Lead Linings, for Tanks, Kettles, Vats, etc.; Agitators; Acid Chambers and Towers; Lead Sleeves; Lead Coils; Chemical Lead Traps; Acid Supply; Drain and Waste Lines. All kinds of Chemical Apparatus, made of lead, to order. Lead Lined Pipe and Fittings. Our Products cover practically everything in the chemical line, where lead is used. We make a specialty of Pure Tin Linings for vessels of every character.

FACILITIES

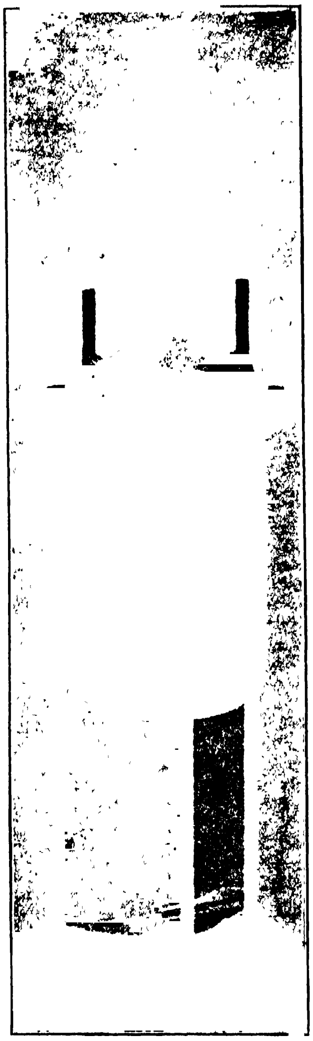
We have recently moved from our old establishment to our new modernly equipped shops at the above address, where we will have ample facilities for production of the largest of lead chemical equipment.

Lead burning in all its branches for chemical plants, etc., will be handled and executed in a thorough and competent manner, regardless of the size of the contract—large or small.

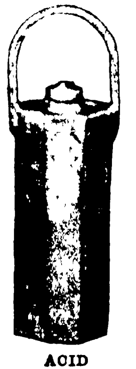
We have extensive business relations with many of the largest concerns and corporations in the United States.



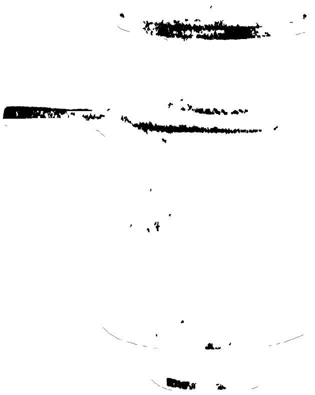
LEAD CONDENSING COIL



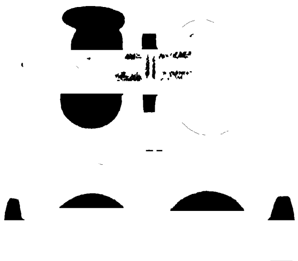
STILL MADE OF LEAD



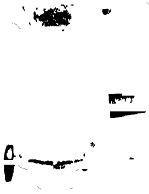
ACID CONTAINER



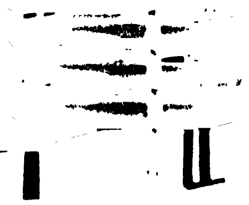
LEAD GAS TRAP



LEAD T'S, L'S, FLANGES, AND FITTINGS, MADE BY US



SOLID TIN CONDENSER



COIL MADE ENTIRELY FROM TIN

LEAD ACID JUGS

ACHESON GRAPHITE COMPANY

Manufacturers of

Acheson Electrodes and Acheson Anodes; Acheson Graphite Powders
Miscellaneous Articles Machined from Pure Graphite Plates and Cylinders
NIAGARA FALLS, N. Y.

PRODUCTS

- **Acheson Electrodes**
- **Acheson Anodes**
- **Acheson Welding Electrodes**
- **Solid Resistance Units**
- **Contacts and Rheostat Discs**
- **Laboratory Utensils—Crucibles, Muffles, Tubes, etc.**
- **Graphite paint pigment**
- **Graphite for mechanical rubber goods**
- **Graphite for dry battery filler**
- **Graphite for foundry facing, packing, etc.**
- **Mold Wash**
- **Granular Resistor for resistance furnaces**

ACHESON ELECTRODES

Acheson Electrodes are manufactured in sizes suitable for operating any electric furnace, from the smallest laboratory furnace to the largest steel furnaces which require current densities over 20,000 amperes. Their use is not confined to steel alone, however, as they are used in every field of Electro-thermic work.

To enumerate, Acheson Electrodes are used in Electric Steel Furnaces, Electric Furnaces for the production of ferro-alloys, carbides, abrasives, and for the electric smelting of various ores such as iron, zinc, and lead They are exclusively used in all of the Electric Arc Brass Furnaces There is no Electric Furnace in use which cannot be adapted easily and at a low cost to use Acheson Electrodes Many of the present furnaces have adopted them as standard Being of solid pure graphite they insure the lowest electrode and power consumption and the greatest current efficiency Carrying with ease the highest currents which are used in Electric Furnace work, they give the lowest possible operating costs with the best working conditions

All Acheson Electrodes are furnished either with plain ends, or with **machined** connections for endwise joining. No paste or joint compound is used in making up the Acheson joint.

ACHESON ANODES

On account of their great purity and workability Acheson Anodes are the most satisfactory anodes which are available for electrolytic work. They are over 99 per cent pure graphite. Acheson Anodes can be readily machined so that any shape or size within practical limits can be secured.

On account of the ease of machining small rods can be threaded into large posts or plates, giving a large working surface with a small leading-in rod at the same time keeping the anode in one solid unit They are capable of easy impregnation so that anode life can be prolonged by the use of beneficial paraffine or oil when the process in question allows impregnation Acheson Anodes are made in many stock sizes and can be shipped either all assembled ready for use, or machined to specifications for assembly at the place required Their long life in use and comparative low cost make them the ideal anode for commercial use Practically all of the producers of electrolytic chlorine and caustic use Acheson Anodes, and the manufacturers of chlorine cells have adopted them as standard equipment Their use, however, is not confined to chlorine cells alone; they are also being very successfully used in chlorate work, in cyanide solutions, in the electrolysis of fused baths, in the electrolytic recovery of copper and in solutions where Fluorine, Bromine, and Iodine are liberated.

ACHESON WELDING ELECTRODES

Acheson Welding Electrodes were developed for use in the carbon-arc welding machines They are made in standard sizes to fit all machines and can be had either pointed or unpointed. Chief among the many advantages of Acheson Welding Electrodes is their high current carrying capacity. On account of this feature they do not heat up, so that the metal holders or clamps are never injured. Flaking or spauling off is eliminated and breakage is rarely encountered. This, of course, together with the low consumption of electrode-per-weld makes their life much greater than that of other welding electrodes, so that they mean not only greater convenience, but lower welding or cutting cost than when other welding electrodes are used.

Contacts, solid resistor units, and laboratory utensils are all cut from solid Acheson plates and cylinders They possess the advantages of high electrical conductivity and great purity, all running over 99 per cent pure graphite Especially in the case of the laboratory utensils such as crucibles, tubes, etc, the very high purity is of inestimable value

Rheostat discs of any diameter or thickness are readily manufactured from Acheson Rods, and very fine gradations in resistance can be obtained by centering these discs on rods or in holders and applying varying pressures by the use of a cam

Stirrers and skimmers for foundry work cut from Acheson Plates are very successful not only on account of their great purity but because of the much longer life they have in actual service.

ACHESON GRAPHITE POWDERS

Over fifty different grades of powdered graphite ranging from by-product grades of low purity to grades over 99.9% pure, and in fineness from coarse resistors to impalpable powders, are manufactured from the highest quality raw materials obtainable.

On account of space limitations it would be impossible to give here a detailed description of each grade of Acheson Graphite manufactured However, for convenience sake, we have listed some of our various grades, showing the particular grades of graphite which are ordinarily used in different fields Complete analysis of each grade will be furnished upon request This table is not a recommendation but simply a rough classification of the various grades

Mail samples are gladly furnished, and complete satisfaction becomes more assured if we are told the purpose for which the graphite is desired. All such information is of course treated as strictly confidential.

PAINT PIGMENT
A A 1 } for high grade paint
A F 1 }
600 } for ordinary graphite paint
700 }
MECHANICAL RUBBER GOODS
424
DRY BATTERY FILLER
No 6 Cells
BB1 BID
452 783
615 697
750 BA2
Flashlight Cells
2301 842
1840 616

FOUNDRY FACING MANUFACTURE
F P C
600
MOLD WASH
For Steel
600 } very high quality
AF1 }
For Non Ferrous Metals
AF1
RESISTORS
Laboratory Resistors
BB4 BB5 BB6
Commercial Resistors
No. 9, ⅛"–¼" mesh
No 12, 1"– 4" mesh

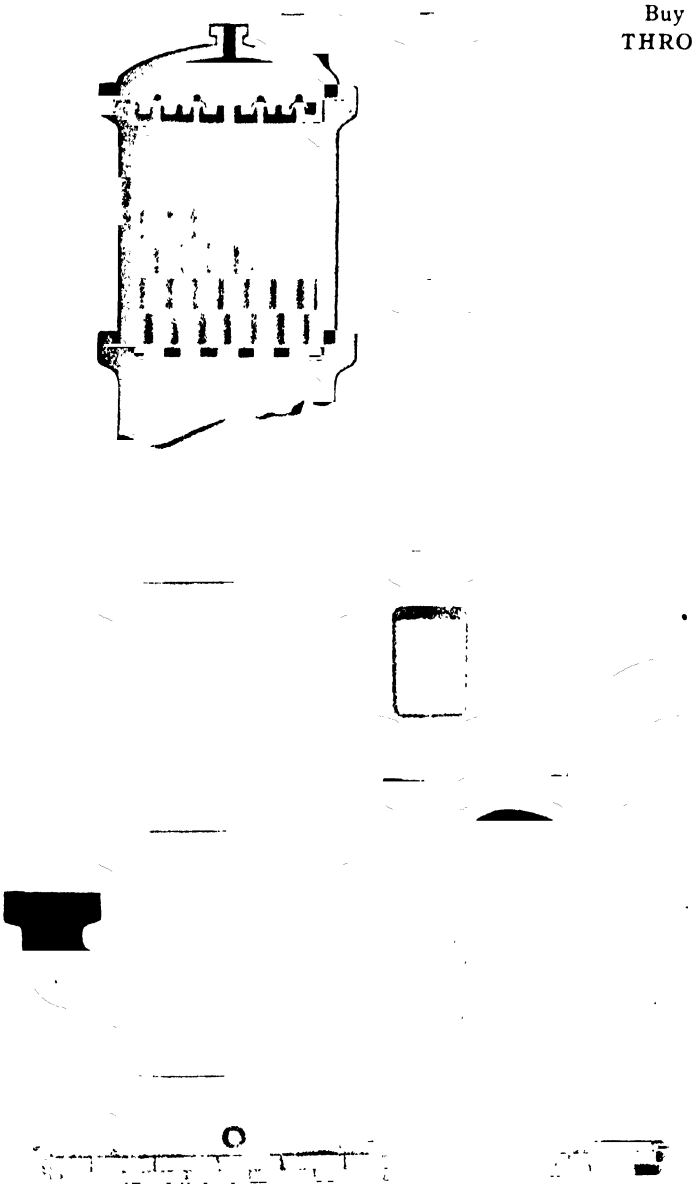
THE ACID PROOF CLAY PRODUCTS CO.

GENERAL OFFICES
401 Flat-Iron Building
AKRON, OHIO

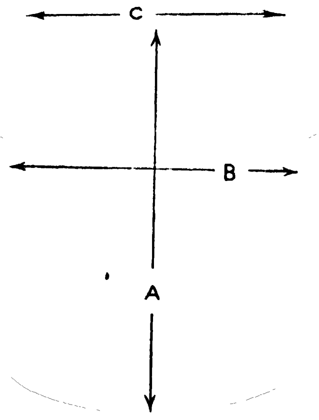
PRODUCTS

"Vitric" Acid Proof Chemical Stoneware Tower Equipment, Flanged or Socket Pipe and Fittings, Return Bends, Damper Pipe, Coils and Cooling Systems, Receivers, Generators, Acid Lifts, Suction Filters, Storage and Straight Side Pots, Boiling Kettles, Stirring Outfits, Acid Eggs, Evaporating Dishes, Acid Tanks, Laboratory Sinks and Supplies, Check Valves, Faucets of all descriptions, Wire Mill Spool Pipe, Acid Plants (Arsenic, Nitric, etc.). Special designs to blue print for your individual needs.

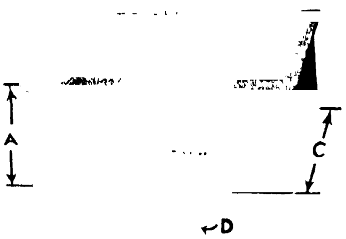
Buy "VITRIC," the best, ACID PROOF THROUGH AND THROUGH.



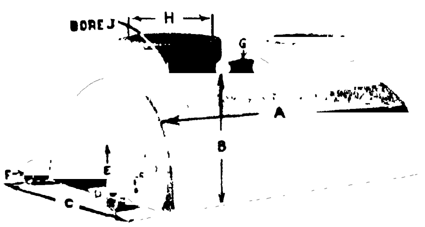
ACID RECOVERY TOWER EQUIPMENT
All sizes



STRAIGHT SIDE POT



LABORATORY SINK



CELLARIUS TOURILL

ACME COPPERSMITHING COMPANY, INC.

1009-11 W. Ohio Street
CHICAGO, ILLINOIS

PRODUCTS

Chemical Equipment of all Kinds constructed of Aluminum, Block Tin, Brass, Bronze, Copper, Lead, Monel Metal, Sheet Iron, Zinc.

- **Autoclaves**
- **Bends**
- **Coils**
  - Cooling
  - Heating
  - Reducing
- **Condensers**
- **Defactors**
- **Digesters**
- **Drums**
  - Scouring Machine
- **Evaporators**
- **Expansion**
  - Joints
  - Bends
- **Extractors**
- **Kettles**
  - Cooking
  - Confectioners
  - Dye
  - Heating
  - Jacketed
  - Varnish
  - and trucks
- **Dyers' Equipment**
  - Dippers
  - Kettles
  - Tanks
  - Vats
- **Pans**
  - Crystallizing
  - Jacketed
  - Revolving
  - Vacuum
- **Receivers**
- **Stills**
  - Alcohol
  - Fractionating
    - Pressure
  - Vacuum
- **Tanks**
  - Heating
  - Storage
- **Vats**

FACILITIES

Our plant is equipped with the latest improved machinery and tools necessary for the construction of standard and special apparatus from aluminum, block tin, brass, bronze, copper, lead, monel metal, sheet iron, zinc or any of the metals that are practical in the sheet form.

One important point we wish to emphasize is the fact that we give all work the strictest supervision and inspection. This care assures you a high grade of workmanship. To further assure quality, we employ none but the best men to be obtained in the trade.

In addition to our own plant the company has favorable connections with reliable foundries and machine-shops to take care of necessary casting and machine work incidental to every piece of equipment. These connections also provide elasticity in that our capacity is thereby made unlimited.

REFERENCES

We will furnish on request the names of several satisfied users of our equipment.

PART OF A SHIPMENT OF 81 REVOLVING PANS AND JACKETED KETTLES

ABBÉ ENGINEERING CO.

Designers of Pulverizing and Grinding Machinery

GENERAL OFFICES
Hudson Terminal Building
50F CHURCH STREET, NEW YORK, N. Y.
Telephones CORTLANDT 54 55 56

PRODUCTS

Ball Mills; Eureka Mills; Jar Mills; Laboratory Mills; Max Mills; Pebble Mills; Sample Mills; Tube Mills; Bolting Cloth; Crushers; Filter Presses; Rotary Cutters.

See announcement of Beach-Russ Co., for Pressure Blowers, Acid and Vacuum Pumps, also Liquid Pumps.

Our machines awarded the Gold Medal at the Panama-Pacific Exposition.

INQUIRIES

When making inquiries it will greatly facilitate matters if our correspondents will advise us regarding the following points:

1. What material is to be reduced.
2. How coarse it will be fed to the machine.
3. How fine (what mesh) the finished product is to be.
4. Capacity desired per hour.
5. Whether it is to be ground wet or dry.
6. If motor drive is desired advise characteristics of electric current available.

TESTING LABORATORY

We maintain a completely equipped testing laboratory with a large number of machines set up ready for use, and prospective purchasers desiring to make a test on their material in our machines are invited to send samples, and we will gladly make a test, the result of which together with our **thirty-nine years'** experience will enable us to recommend the proper machine for the purpose. Tests will be made free of charge, but samples must be sent to us charges prepaid. Write for shipping instructions.

LABORATORY MILLS

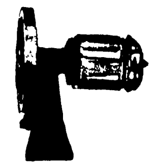
In presenting our Sample Mills, Laboratory Mills, Jar Mills "A" and "B," and Eureka Mills, we desire to call special attention to the fact that the porcelain jars of these machines are manufactured from the finest raw materials obtainable, made in the plastic state, thus forming jars that are impervious to the action of even such a material as ink.

In addition to the machines illustrated herewith, we also build mills having 3, 4, 6, 8, and 12 jars. The advantage of building the machines with jars in batteries is that a different material can be ground or mixed in each jar at one operation. We have given particular attention to the design of these machines so that they are easily taken out and replaced.

Our laboratory mills are particularly adapted for the grinding of small quantities of materials, being used by the various departments of the United States Government Assay and Testing Laboratories, Chemical and Dyestuff Laboratories, etc.

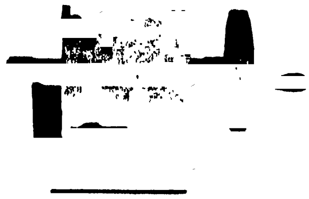
We can furnish any of our mills with motor drive, and when inquiring for price, it is necessary to have the characteristics of the electric current available so that the proper motor can be furnished.

A partial list of materials that can be ground in these jars is given on page 253 under the list of materials that can be ground in Abbé Pebble Mills.

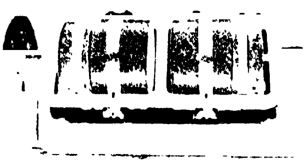


SAMPLE MILL
Abbé Engineering Co.

DOUBLE SAMPLE MILL
Abbé Engineering Co
Can also be supplied with five jars



LITTLE TROJAN MILL
Abbé Engineering Co.



DOUBLE TROJAN MILL
Abbé Engineering Co.
Either of above can also be equipped with one or two sample jars attached

CAPACITY AND SIZE OF ABBÉ ONE-PIECE PORCELAIN JARS

Size	Outside Diam	Height	Capacity		
			Chg based on Sand	Total Volume in Gals	in Liters
Sample	5.2 in.	5.71 in.	1½ lbs	0.288	1.08
Laboratory or Trojan	8.75 in.	9.65 in	5 lbs	1.887	5.22
Jar "A"	13 in.	12.5 in.	15 lbs	4.0	15.20
Jar "B"	14.75 in.	16.5 in.	25 lbs.	6.6	25.08
Jar "C"	11⅛ in.	13⅝ in.	15 lbs.	4.0	15.02
No. 1 Eureka	17.72 in.	10 in.	30 lbs.	7.66	29.11
No. 2 Eureka	17.72 in.	18.7 in.	60 lbs.	15.6	59.28
No. 3 Eureka	22.5 in	19 in.	80 lbs.	23.8	90.44

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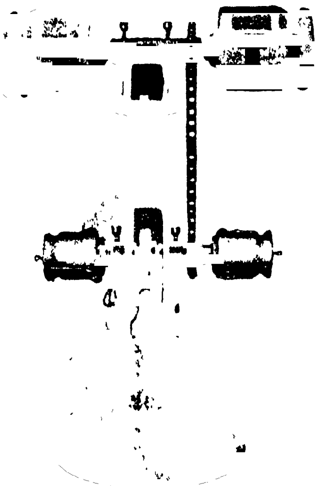
COMBINATION LABORATORY MILL



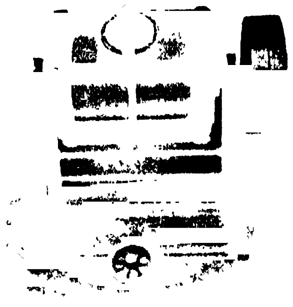
COMBINATION LABORATORY MILL
Abbé Engineering Co

On account of the large demand for a machine which would be compact, simple and easy of access, we have designed our Combination Laboratory Mill. It can be arranged for direct motor drive if desired; thus it can be installed in the most convenient part of the laboratory, regardless of line shafts, pulleys, etc. We manufacture this mill in a very large number of different combinations, having 2 - 4 - 6 or 12 jars.

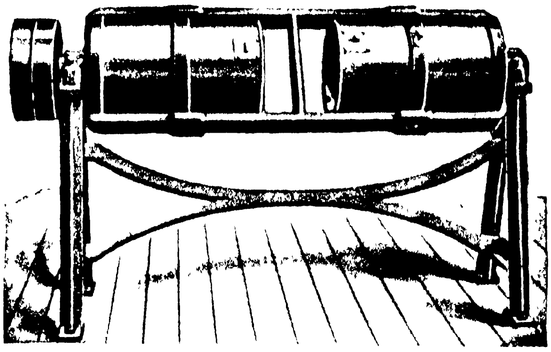
The jars adapted for this machine are:
Sample Jar, up to 1½ lbs. Jar "A," up to 15 lbs.
Laboratory Jar, up to 5 lbs. Jar "B," up to 25 lbs.

12 JAR LABORATORY MILL
Also made with 4, 6 and 18 jars
Abbé Engineering Co

JAR MILL "B"
We also make a double mill with two jars
Abbé Engineering Co.



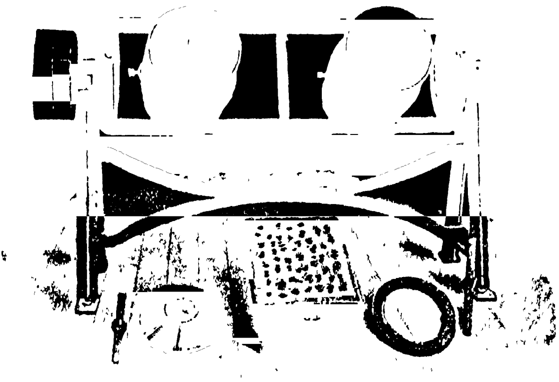
EUREKA MILL, BUILT IN 3 SIZES
Abbé Engineering Co



DOUBLE JAR MILL "C" (Closed)
Also made with single jar
Abbé Engineering Co

This machine is particularly adapted for the grinding and testing of paper pulp, having been standardized for this work, although it is also suitable for the same kind of work as our other Jar Mills.

The Jar is protected by a steel casing and so arranged that it does not have to be lifted out when emptying a finished charge.



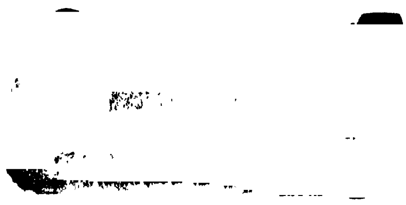
DOUBLE JAR MILL "C" (Open)
Abbé Engineering Co.

TABLE OF SIZES AND CAPACITIES

See table on page 250 for sizes and capacities of Jars.

Continued on Next Page

ABBÉ TUBE MILL (PATENTED)



ABBÉ TUBE MILL—TRUNNION STYLE (Patented)
Abbé Engineering Co

We manufacture Tube Mills in both the Trunnion and Tire types, the Tire type requiring from 25% to 30% less power to drive them than the Trunnion. All of our Tube Mills are equipped with our **Patented Ideal Spiral Feed and Discharge** which enables the loading of the mill above the center, and increases the capacity, at the same time decreases the power required.

ABBÉ TUBE MILL—TIRE STYLE (Patented)
Abbé Engineering Co

PRICE LIST FOR THE GENUINE DUFOUR SWISS SILK BOLTING CLOTH

Price Per Yard, 40 Inches Wide

Meshes per lineal inch	Number	Standard	Extra heavy X	Double Extra XX	Meshes per lineal inch	Number	Treble Extra XXX	Grit Gauze	XXX Grit Gauze
18	0000	$2 45	.	$2 95	.	...	. .	No.	No.
23	000	2 55		3 00			.. .	Equals	Equals
29	00	2.60	.. .	3 10	.		.....	16-0000	14-16
38	0	2 65		3 20	..	...	. .	18	16 18
48	1	2 75	. .	3 30			.	20 000	18-20
54	2	2 85	. ...	3 45	..	...	.	22	20-22
58	3	3 00	. .	3 60			.	24	22-24
62	4	3.10	....	3 80	.	.	. .	26 00	24 26
66	5	3.20	. .	3 95	.		.	28	26 28
74	6	3.40	$3 75	4.10	71	6	$4 35	30	28-30
82	7	3 55	3 90	4 30	74	7	4 55	32	30 34
86	8	3.90	4 25	4 55	82	8	4 80	34 0	32 36
97	9	4.20	4 60	4 85	86	9	5 05	36	34-38
109	10	4 60	4 90	5 15	97	10	5 35	38	36 40
116	11	4 85	5 20	5 40	109	11	5 65	40	38-42
125	12	5.20	5 50	5 90	116	12	6 10	42	40 44
129	13	5.40	5 80	6.30	125	13	6 50	44 1	42-46
139	14	5 70	6 10	6 70	129	14	6 90	46	44 48
150	15	6.10	6 75	7 15	139	15	7 50	48	46-50
157	16	6 75	7 30	8 00	150	16	8 50	50 2	48-52
163	17	7.50	8.00	. .	157	17	9 50	52	50 54
166	18	9 00	....		163	18	11 40	54-3	52-56
169	19	10.15				.		56	54-58
173	20	11 20	.....	..	.	.	...	58-4	56 60
178	21	12 00	.		...			60	58-62
200	25	14 00	.	. . .	...		. . .	62-5	60-64
								64	62 66
								66 6	64-68
								68	66 70
								70 7	68 72
								72	70

244 x 200, $12 00
275 x 100, $13 00
Grit-Gauze, all Nos , $4 65
XXX Grit Gauze, all Nos , $5 75

Cloths made up promptly and in the most perfect manner to fit any reel sieve frame.

Webbing furnished in place of Ticking, if desired. Orders shipped the same day we receive them. We import this cloth direct from Switzerland.

ABBÉ PEBBLE MILLS (PATENTED)

Particularly adapted for Pulverizing or Mixing, Dry or Wet.

These are of the batch or intermittent type, the cylinder being approximately half filled with either pebbles or porcelain balls, or metal balls. The material is put into the cylinder through a manhole opening or door, after which the tight cover is fastened securely which practically hermetically seals the mill. Then the cylinder is revolved for a given period of time (this time depending on the hardness of the material and the fineness to which it is to be ground), after which the tight cover is replaced by the grate discharge cover, and the cylinder revolved until the material is sifted through the openings in the grate, and the pebbles or balls are retained in the cylinder.

For dry grinding, it is usually customary to build a casing around the mill to prevent dusting while discharging.

In wet grinding, the same directions are followed except there is no casing required; also instead of replacing the tight cover with a grate cover, we provide a special cover with a valve for emptying the mill.

Patented Manhole Frame—(This feature can only be had with our machines)—The manhole frames of all our Pebble Mills are made with detachable flanges, so that they can be easily replaced with new pieces of flat sheet iron when the inside lining is worn out. These are the flanges that hold the lining in position and gradually wear down with the same. To users of these mills this improvement will readily appeal as an important factor, **as it avoids the riveting in of new manhole frames when a machine is to be relined.**

Linings—Our mills are lined with either best vitrified porcelain blocks, silex blocks, cast iron, steel, or wood.

LITTLE JUMBO NO. 1 FEED MILL

This mill is attractive in appearance, durable and efficient.

Size of Pulley, 6 x 4.
Capacity, 10 to 30 bushels per hour.
Speed, 290 to 1,150 R.P.M.
Shaft, 1⅛ in. cold rolled.
Burr, 6 inches.
Weight, 90 pounds.
Height, 33 inches.

Made of steel and iron throughout, bearings are long and well babbitted. Mill is provided with safety springs to protect burrs from nails, nuts, etc. The screw for adjusting burrs admits of grinding grain to practically any degree of fineness desired for feed.

One set of fine burrs, also one set of coarse burrs, furnished with each machine.

LITTLE JUMBO NO. 1 FEED MILL

Speed R P M	H P Required	Bu Ground Per Hour
550	1½	10
670	2½	15
800	3	20
920	3¼	25
1150	5	30

Price $35.00 net F. O. B. New York.

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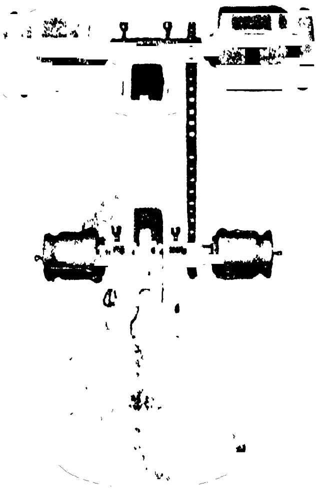
COMBINATION LABORATORY MILL



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Abbé Engineering Co

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Laboratory Jar, up to 5 lbs. Jar "B," up to 25 lbs.

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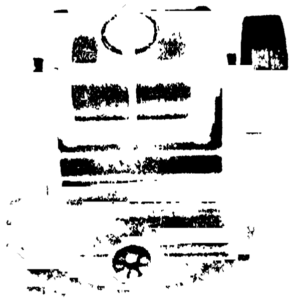
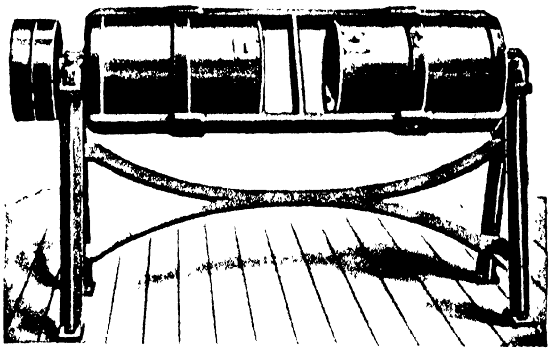


EUREKA MILL, BUILT IN 3 SIZES
Abbé Engineering Co



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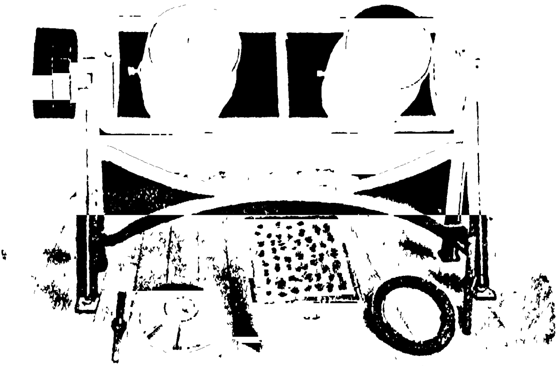
This machine is particularly adapted for the grinding and testing of paper pulp, having been standardized for this work, although it is also suitable for the same kind of work as our other Jar Mills.

The Jar is protected by a steel casing and so arranged that it does not have to be lifted out when emptying a finished charge.



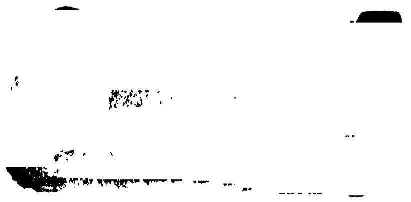
DOUBLE JAR MILL "C" (Open)
Abbé Engineering Co.

TABLE OF SIZES AND CAPACITIES

See table on page 250 for sizes and capacities of Jars.

Continued on Next Page

ABBÉ TUBE MILL (PATENTED)



ABBÉ TUBE MILL—TRUNNION STYLE (Patented)
Abbé Engineering Co

We manufacture Tube Mills in both the Trunnion and Tire types, the Tire type requiring from 25% to 30% less power to drive them than the Trunnion. All of our Tube Mills are equipped with our **Patented Ideal Spiral Feed and Discharge** which enables the loading of the mill above the center, and increases the capacity, at the same time decreases the power required.

ABBÉ TUBE MILL—TIRE STYLE (Patented)
Abbé Engineering Co

PRICE LIST FOR THE GENUINE DUFOUR SWISS SILK BOLTING CLOTH

Price Per Yard, 40 Inches Wide

Meshes per lineal inch	Number	Standard	Extra heavy X	Double Extra XX	Meshes per lineal inch	Number	Treble Extra XXX	Grit Gauze	XXX Grit Gauze
18	0000	$2 45	.	$2 95	.	...	. .	No.	No.
23	000	2 55		3 00			.. .	Equals	Equals
29	00	2.60	.. .	3 10	.		.....	16-0000	14-16
38	0	2 65		3 20	..	...	.	18	16 18
48	1	2 75	. .	3 30			.	20 000	18-20
54	2	2 85	....	3 45	..	...	.	22	20-22
58	3	3 00	. .	3 60			.	24	22-24
62	4	3.10	....	3 80	.	.	. .	26 00	24 26
66	5	3.20	. .	3 95	.		.	28	26 28
74	6	3.40	$3 75	4.10	71	6	$4 35	30	28-30
82	7	3 55	3 90	4 30	74	7	4 55	32	30 34
86	8	3.90	4 25	4 55	82	8	4 80	34 0	32 36
97	9	4.20	4 60	4 85	86	9	5 05	36	34-38
109	10	4 60	4 90	5 15	97	10	5 35	38	36 40
116	11	4 85	5 20	5 40	109	11	5 65	40	38-42
125	12	5.20	5 50	5 90	116	12	6 10	42	40 44
129	13	5.40	5 80	6.30	125	13	6 50	44 1	42-46
139	14	5 70	6 10	6 70	129	14	6 90	46	44 48
150	15	6.10	6 75	7 15	139	15	7 50	48	46-50
157	16	6 75	7 30	8 00	150	16	8 50	50 2	48-52
163	• 17	7.50	8.00	. .	157	17	9 50	52	50 54
166	18	9 00	....		163	18	11 40	54-3	52-56
169	19	10.15				.		56	54-58
173	20	11 20	.....	..	.	.	...	58-4	56 60
178	21	12 00	.		...			60	58-62
200	25	14 00	. .	. . .	...		. . . .	62-5	60-64
								64	62 66
								66 6	64-68
								68	66 70
								70 7	68 72
								72	70

244 x 200, $12 00
275 x 100, $13 00
Grit-Gauze, all Nos , $4 65
XXX Grit Gauze, all Nos , $5 75

Cloths made up promptly and in the most perfect manner to fit any reel sieve frame.

Webbing furnished in place of Ticking, if desired. Orders shipped the same day we receive them. We import this cloth direct from Switzerland.

ABBÉ PEBBLE MILLS (PATENTED)

Particularly adapted for Pulverizing or Mixing, Dry or Wet.

These are of the batch or intermittent type, the cylinder being approximately half filled with either pebbles or porcelain balls, or metal balls. The material is put into the cylinder through a manhole opening or door, after which the tight cover is fastened securely which practically hermetically seals the mill. Then the cylinder is revolved for a given period of time (this time depending on the hardness of the material and the fineness to which it is to be ground), after which the tight cover is replaced by the grate discharge cover, and the cylinder revolved until the material is sifted through the openings in the grate, and the pebbles or balls are retained in the cylinder.

For dry grinding, it is usually customary to build a casing around the mill to prevent dusting while discharging.

In wet grinding, the same directions are followed except there is no casing required; also instead of replacing the tight cover with a grate cover, we provide a special cover with a valve for emptying the mill.

Patented Manhole Frame—(This feature can only be had with our machines)—The manhole frames of all our Pebble Mills are made with detachable flanges, so that they can be easily replaced with new pieces of flat sheet iron when the inside lining is worn out. These are the flanges that hold the lining in position and gradually wear down with the same. To users of these mills this improvement will readily appeal as an important factor, **as it avoids the riveting in of new manhole frames when a machine is to be relined.**

Linings—Our mills are lined with either best vitrified porcelain blocks, silex blocks, cast iron, steel, or wood.

LITTLE JUMBO NO. 1 FEED MILL

This mill is attractive in appearance, durable and efficient.

Size of Pulley, 6 x 4.
Capacity, 10 to 30 bushels per hour.
Speed, 290 to 1,150 R.P.M.
Shaft, 1⅞ in. cold rolled.
Burr, 6 inches.
Weight, 90 pounds.
Height, 33 inches.

Made of steel and iron throughout, bearings are long and well babbitted. Mill is provided with safety springs to protect burrs from nails, nuts, etc. The screw for adjusting burrs admits of grinding grain to practically any degree of fineness desired for feed.

One set of fine burrs, also one set of coarse burrs, furnished with each machine.

LITTLE JUMBO NO. 1 FEED MILL

Speed R P M	H P Required	Bu Ground Per Hour
550	1½	10
670	2½	15
800	3	20
920	3¼	25
1150	5	30

Price $35.00 net F. O. B. New York.

Continued on Next Page

ACME TANK COMPANY

39 Cortlandt Street

NEW YORK, N. Y.

PRODUCTS

Wooden Tanks for water supply, chemical and color works, and all other purposes.

Wooden Tanks and Steel Towers for village or factory, fire protection, water supply, etc.

Tanks and towers built in accordance with specifications of National Board of Fire Underwriters or Associated Factory Mutual Fire Insurance Companies.

Lead Lined Tanks.

Round or rectangular tanks with copper, brass or Monel metal rods.

MATERIALS USED

The Acme Wood Tanks are built of California Redwood, Washington Fir, Cypress, Yellow Pine and White Cedar.

CAPACITIES AND SIZES

Made in all sizes, round and rectangular, ranging in capacity from 50 to 500,000 gallons. The cylindrical tank is the best form of construction and cheaper than any other. Rectangular and oval tanks are only used when special requirements make it necessary.

List showing sizes, capacities, hooping, weights, etc., sent on request.

CHEMICAL AND METALLURGICAL TANKS

Long experience has proven that California Redwood has greater acid resisting qualities than any other known material. California Redwood (Sequoia sempervirens) contains a natural preservative which makes it immune to the attacks of wood boring worms or insects, common enemies to other species of wood, and makes it impervious to the destructive action of acid and alkaline solutions.

40,000 GALLON TANK AND 100' TOWER

Redwood tanks are, therefore, natural containers for the many solutions used in the chemical and metallurgical industries. When properly seasoned Redwood shrinks less than any other wood. It is not affected by extremes of temperature. It is free from pitch and resinous matter. The stock used by this Company is thoroughly seasoned, clear, air-dried Redwood, free from sap, pitch, knots or other imperfections.

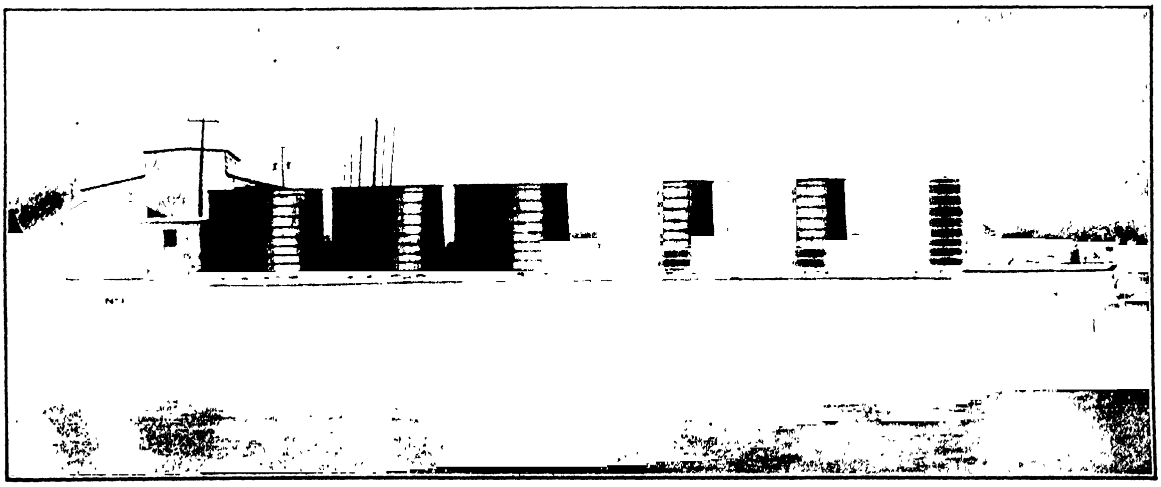
Practically every mining company in the West uses Redwood tanks for holding sulphuric and nitric acid solutions. The U. S. Government used hundreds of Redwood tanks for storage and manufacturing purposes in its various chemical and explosive plants during the recent war.

SHIPMENTS

Shipments can be made to any part of the country from our New York, California or Illinois factories.

GENERAL

Wood tanks are usually built of 2″, 2½″ or 3″ material, according to the size of tank and proposed use. For special purposes they are sometimes built of 4″, 6″ or heavier material. We carry all of these thicknesses in stock. 2″ material can ordinarily be used for capacities to 10,000 gallons.



ACME REDWOOD TANKS USED FOR STORING FUEL OIL

WM. AINSWORTH & SONS

THE PRECISION FACTORY

DENVER, COLORADO, U. S. A.

PRODUCTS

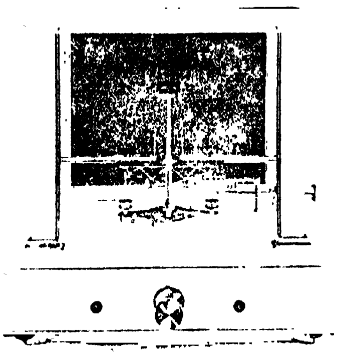
Balances, Assay, Analytical and Pulp.
Weights, Metric of Precision.
Transits, Theodolites and Levels.
The Improved Type Brunton Patent Pocket Transit.

LITERATURE

Catalog A-31 of Balances and Weights.
Bulletin A-31 of Analytical Balances and Weights.
Catalog B-31 of Engineering Instruments.

ASSAY BALANCES

Supplied in both standard and inverted types ranging in sensitivity from 1/100 to 1/500 Mg. either with or without our Improved Multiple Rider Carrier which handles all fractional weights up to 50 milligrams.



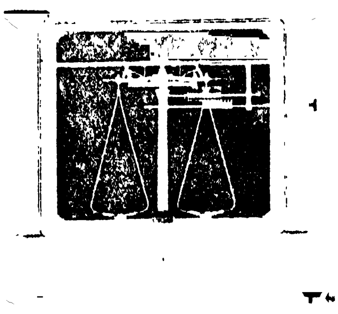
INVERTED TYPE VB ASSAY BALANCE
With Improved Multiple Rider Carrier

ANALYTICAL BALANCES

Supplied in several grades and types adapting them to the laboratory requirements of Steel, Chemical and Smelting Works, Industrial Plants and Educational Institutions.

This Type T analytical balance with Improved Multiple Rider Carrier makes for increased speed and accuracy in the laboratory. No fractional weights are required to be handled.

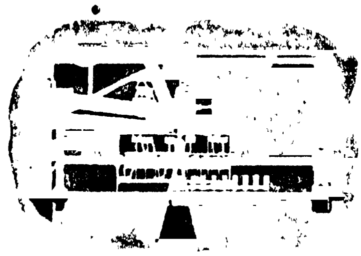
Sensitivity 1/20 Mg.



TYPE T ANALYTICAL BALANCE
With Improved Multiple Rider Carrier

IMPROVED MULTIPLE RIDER CARRIER

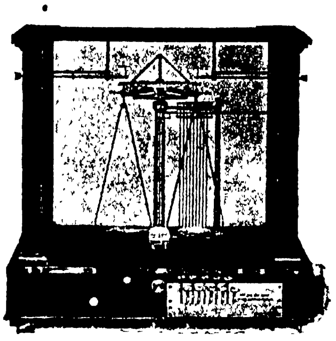
This device is extensively used in laboratories where speed and accuracy are prime requisites. Its use will speed up your laboratory work and quickly pay the initial cost of attaching to any of our balances. Handles all fractional weights and has a capacity of 1215 milligrams.



IMPROVED MULTIPLE RIDER CARRIER

KEYBOARD WEIGHT CARRIER

You cannot afford to use antiquated balances at any price since our Type QC analytical balance with Keyboard Weight Carrier will pay handsome dividends from the start through the saving in time required for weighing. Capacity of carrier 2115 Mg. Sensitivity 1/20 Mg.

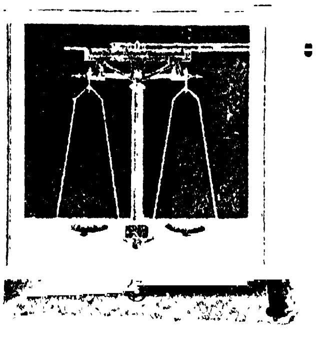


TYPE QC ANALYTICAL BALANCE
With Improved Multiple Rider Carrier

VERNIER RIDER CARRIER

This device weighs up to 50 Mg. with the rider which is also used for balancing, and attached to our Type LL analytical balance makes a low priced outfit for rapid weighing to 1/10 Mg. sensitivity.

Send for catalog.



TYPE LL ANALYTICAL BALANCE
With Vernier Rider Carrier

AJAX ELECTROTHERMIC CORPORATION

(Division of The Ajax Metal Company)

Manufacturers of

The Ajax-Northrup High Frequency Induction Furnace

636 East State Street
TRENTON, N. J., U. S. A.

PRODUCTS

Ajax-Northrup High Frequency Induction Furnaces, including high frequency converter systems, standard plain and vacuum type laboratory furnaces, industrial melting and annealnig furnaces.

GENERAL FEATURES

The furnace is radically new in furnace practice and secures results unobtainable by orthodox methods.

The required current is obtained through our standard high frequency converter system which operates on 110 or 220 volt 60 cycle current It can also be adapted to other voltages and frequencies. The system is practically noiseless, is certain in operation, has no moving parts, and is to all intents and purposes indestructible.

The high frequency converter system is the relatively costly portion of the equipment The furnaces are inexpensive and, once the system is installed, many adaptations for different heating problems are easily made by adding different standard or special inductor furnaces.

FOR LABORATORY USE

The following features recommend the furnace for use in laboratory work:

Exceptionally Quick Heating: 2600° C. in 15 minutes, using chamber 2″ inside diameter by 7″ long, operating with 20 KW drawn from service lines;

Accurate Temperature Control: Infinitesimal gradations of temperature obtainable;

Furnace Cool Outside: Making it possible to work with furnace on the hottest days;

Quick Changing Possibilities: Rapid changes from one material to another;

Small or Large Melts: Either can be made with equal facility;

Melts in Vacuo: Or in oxidizing, reducing or neutral atmospheres;

Carbon Free Melts: Conducting materials can be melted absolutely free from carbon.

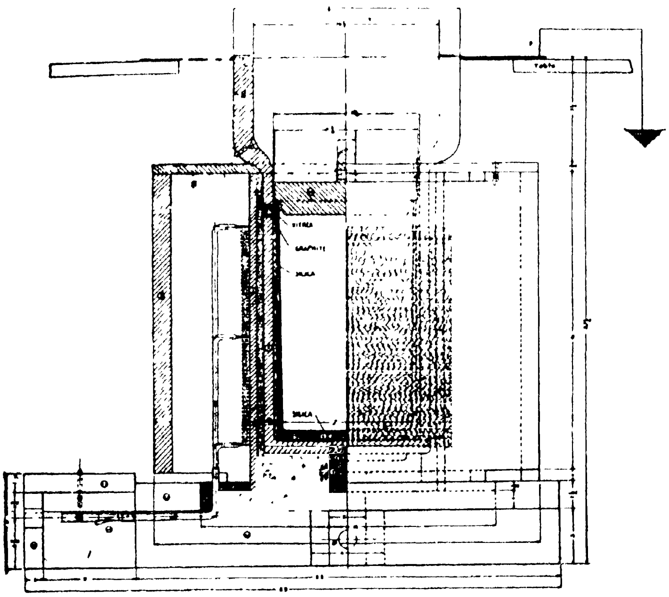


FIG. 1. CROSS-SECTIONAL VIEW OF FURNACE FOR GOLD AND SILVER MELTING WITH 18 K. W. OUTFIT

This amount of power will produce the nickel point (1452°C), without difficulty, in this size furnace. The crucible will hold about 95 kilograms of gold.

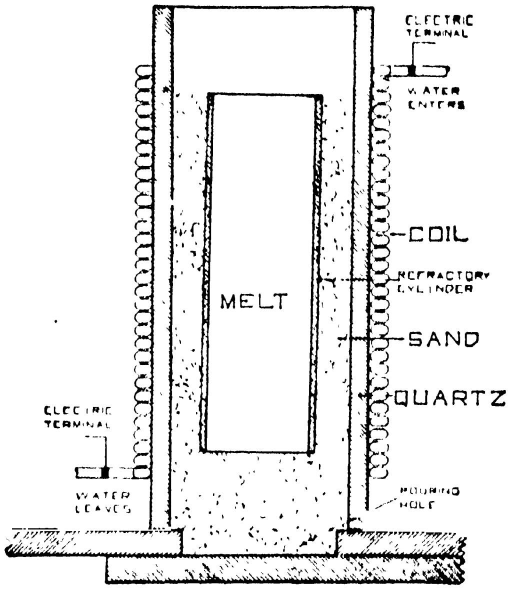


FIG. 2. CROSS-SECTIONAL VIEW OF FURNACE FOR MAKING MELTS WITHOUT A CRUCIBLE

The central "Refractory Cylinder" may ofttimes be dispensed with. This type is especially valuable for the making of carbon-free alloys

FOR COMMERCIAL USE

Platinum, Gold, Silver and all alloys of the precious metals can be melted in small lots with efficiencies far higher than those now obtainable with oil or gas.

Tool Steel and resistance and thermocouple alloys are melted by direct induction in the metals. The melt is kept absolutely free of carbon.

FOR ANNEALING

All Metals can be annealed by direct induction. This heats the entire mass to a uniform temperature from within.

INFORMATION

Further information covering the manifold advantage of the Ajax-Northrup Direct Induction Furnace for laboratory and commercial use will be gladly furnished on request.

ALBERENE STONE COMPANY

223 East 23d Street, NEW YORK, N. Y.

BRANCH OFFICES

BOSTON, MASS.
51 Bristol St

CHICAGO, ILL.
214-222 No. Clinton St.

PHILADELPHIA, PA.
1511 Walnut St

PITTSBURGH, PA

NEWARK, N J
43 Halsey St

PRODUCTS

"Alberene Stone" is used for the following purposes:

- Acid Tanks
- Backs for wall tables
- Balance tables
- Bases for hoods
- Brick for furnace linings
- Drainboards
- Electrical barriers, switchboard panels, bases, and conduit
- Flooring
- Flues
- Gutters
- Hoods (Chemical)
- Hoods (Fume)
- Laboratory Fixtures
- Linings for smelting furnaces
- Pegboards for draining glassware
- Reagent shelves
- Sinks
- Supports
- Superstructure for hoods
- Sand Baths
- Steam Baths
- Strainers
- Smelting furnace linings for the sulphate, soda, and kraft pulp processes
- Table tops
- Vats
- Window sills
- Work benches

"ALBERENE STONE"

"Alberene Stone" is the trade name applied exclusively to the output of the quarries of the Alberene Stone Company and serves as an identification and guarantee of quality and service "Alberene Stone" is a natural *quarried soapstone*, gray in color, close-grained, non-porous and of uniform density and hardness, the qualities of "Alberene Stone" rendering it non-absorbent and resistant to acid and alkali, make it the most serviceable material for laboratory equipment These qualities have made it *invaluable* for table tops, sinks, gutters, reagent shelves and fume hoods.

QUARRIES AND MILLS

FACILITIES

The quarries and mill of the Alberene Stone Company located at Schuyler, Va , are connected by the company's railroad with the Chesapeake & Ohio and the Southern Railways, insuring prompt service and delivery

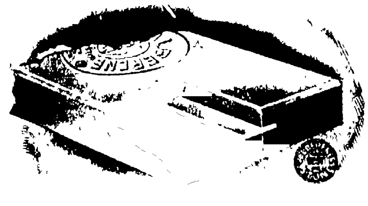
The machinery for operating the quarries and the mills is constantly being improved, thus maintaining high standards of efficiency in mill work and insuring accuracy of execution in the fulfillment of orders.

FIXTURES

"Alberene Stone" Table Tops for Industrial, Research, Control and Educational Laboratories are proving most satisfactory.

CONSTRUCTION

The construction employed in the installation of "Alberene Stone" is shown in the accompanying cuts The slip-tongue joint makes possible the installation of table tops of any length which may be required The joints made by this method are practically imperceptible



SLIP-TONGUE JOINT

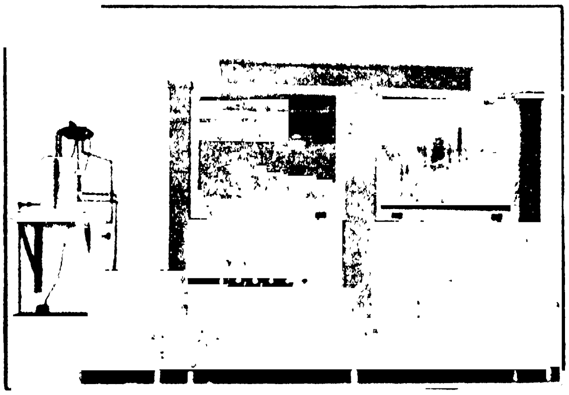
Sinks, gutters and tanks are locked together with concealed bolts and nuts and a tongued and grooved joint is employed, similar to that illustrated This method of construction renders these fixtures perfectly watertight, and by the use of a suitable cement (such as glycerine and litharge), and protection at the joints, satisfactory resistance to the action of acid and alkali is secured.

FUME HOODS

The non-absorbent quality of "Alberene Stone" together with its density renders it remarkably resistant to the action of corrosive fumes and makes possible the construction of a superstructure which is air, fume

Continued on Next Page

and gas-tight and a protection to the chemist and others at work in the laboratory. By means of proper ventilation, fumes that are heavier than the atmosphere as well as those that are lighter, may be rapidly exhausted through the vent flue.



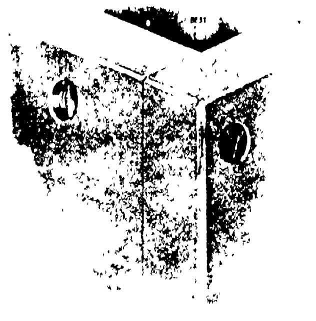
"ALBERENE STONE" FUME HOOD

COST

The first cost of an "Alberene Stone" Hood is fully justified by the service which it renders. The non-corrosive quality of the material and the freedom from all upkeep charges in connection with this equipment, have been demonstrated by years of satisfactory service.

INSTALLATION

The Alberene Stone Company has assumed full responsibility for the delivery and erection of the equipment in the laboratories of the leading Industrial Plants and Universities, and, therefore by experience and through well-organized departments, is able to prepare details of all equipment and to carry out the installation under the supervision of its own mechanics. These installations may be made upon foundations provided by the owners, or other contractors, or the Alberene Stone Company will assume a contract for the complete interior equipment of the laboratory, consisting of the table tops, reagent shelves, sinks, gutters, hoods, flooring and supports of pipe frames or cabinet work, if it is so desired. The only items which are not included consist of the plumbing and ventilation connections and fittings.



TONGUED AND GROOVED, BOLTED JOINT

CARE OF EQUIPMENT

"Alberene Stone" can be kept clean and free from stains by washing, or by the use of sand-paper or sandstone. Some chemists darken the stone by the use of oil or other preparations in order to give a uniform black finish. For microscope tables an enamel paint may be applied, if desired.

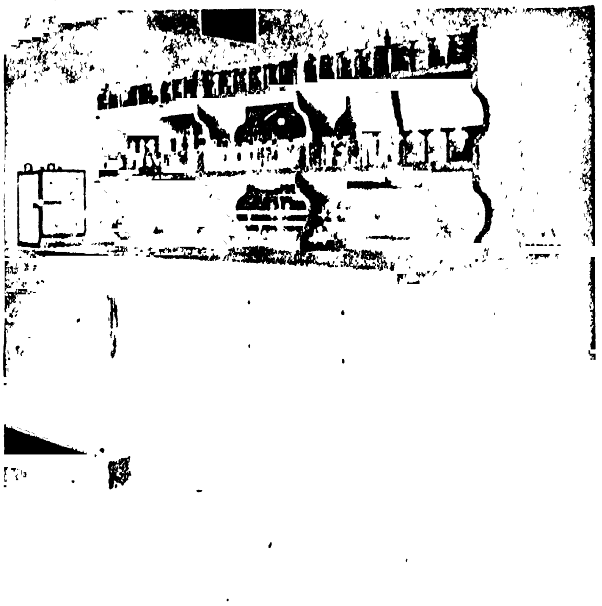
HEAT RESISTANCE

"Alberene Stone" is a fire stone, having a very low coefficient of expansion, and therefore withstands the heat in hood bases, and proves most satisfactory for the linings of smelting furnaces in the recovery process for sulphate, kraft and soda plants of the pulp and paper industry, and also for smelting furnaces in other industries where heat and chemical reactions create problems.

USERS

The best evidence of the value of "Alberene Stone" and its resistance to the action of acid and alkali is to be found by the investigation of laboratories in which it has been in use for ten, twenty or more years. A few installations are listed below.

Aluminum Co. of America
American Sugar Refining Co.
Barrett Co.
Bethlehem Steel Co.
Catholic University of America
Chicago University
Columbia University
Cornell University
Crucible Steel Co.
E. I. du Pont de Nemours & Co.
General Chemical Co.
Goodyear Tire & Rubber Co.
Hills Bros. Co.
Jefferson Medical College
Johns Hopkins University
Lackawanna Railroad Co.
Arthur D. Little, Inc.
Loose-Wiles Biscuit Co.
Massachusetts Institute of Technology
Mellon Institute of Industrial Research
Merck & Co.
National Biscuit Co.
National Sugar Refining Co.
New Jersey Zinc Co.
New York State Board of Health
Northwestern University
Pennsylvania Railroad
Princeton University
Queens University
Rockefeller Institute for Medical Research
Scovill Mfg. Co.
Southern Railway System
Standard Oil Co.
Syracuse University
Tide Water Oil Co.
Toronto University
U. S. Bureau of Chemistry
U. S. Bureau of Standards
U. S. Bureau of Mines
U. S. Mints and Assay Offices
U. S. Navy Department
United States Rubber Co.
U. S. Steel Corporation
U. S. War Department
Wilson & Co.
Wooster University
Yale University



"ALBERENE STONE" TABLE TOP, REAGENT SHELVES WITH SUPPORTS, FLOORING AND BASE

NEW USES AND SERVICE

More than thirty years of experience enables the Alberene Stone Company to supply information concerning equipment and submit details and illustrations of a wide variety of installations. Investigations are being continually made with the view to applying Alberene Stone to new uses. We can readily adapt the equipment which we furnish to the special needs of research and laboratory operation. Samples will be furnished for tests. This company guarantees its products against defective material and workmanship.

THE ALLBRIGHT-NELL COMPANY

Manufacturers and Chemical Engineers

CHICAGO, ILLINOIS, U. S. A.

PRODUCTS

- **Filter Presses**
- **Hydraulic Presses**
- **Knuckle Joint Presses**
- **Cooling Drums**
- **Agitators**
- **Dryers**
- **Condensers**
- **Evaporators**
- **Perfect Circulators**

Complete Plants for

- Edible Oil Refining and Deodorizing
- Lard Compound
- Salad Oil and Oil Hydrogenating
- Packing Houses
- Meat Canning
- Soap, Glue, Tankage, Fertilizer and Rendering

SERVICES

If our customers or prospective purchasers are confronted with any problem connected with food manufacture, whether it be increase of production, manufacture of new products, working up of by-products or disposal of waste, they are invited to refer it to this Company; and our chemical engineers, who are specialists in food products manufacture, will solve each problem without delay.

ANCO PERFECT CIRCULATOR

A Scientifically Designed, Patented Agitator.

Silent, Economical, Perfect Circulation.

Produces the most thorough mix in the shortest length of time.

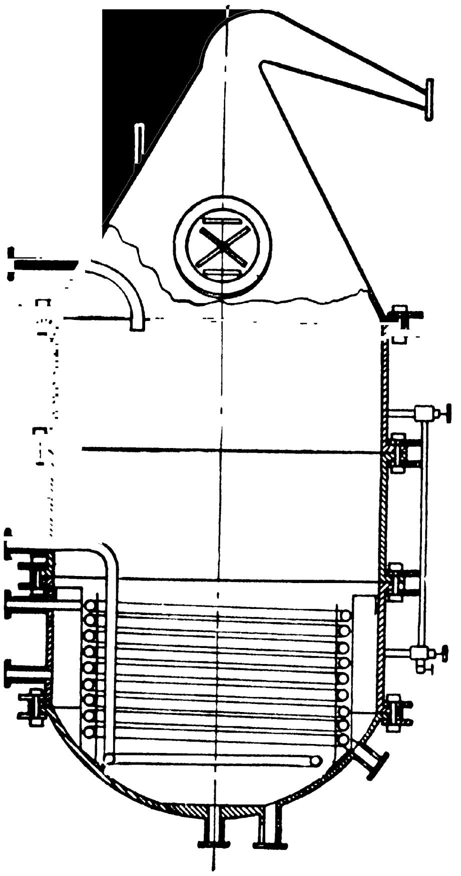
The propellers, rotating in opposite directions, lift the liquids directly in the center, forming a continuous, even circulation, and causing every part of the liquid to be completely atomized.

The flow of the liquid picks up any solids which may settle on the bottom or sides of the tank.

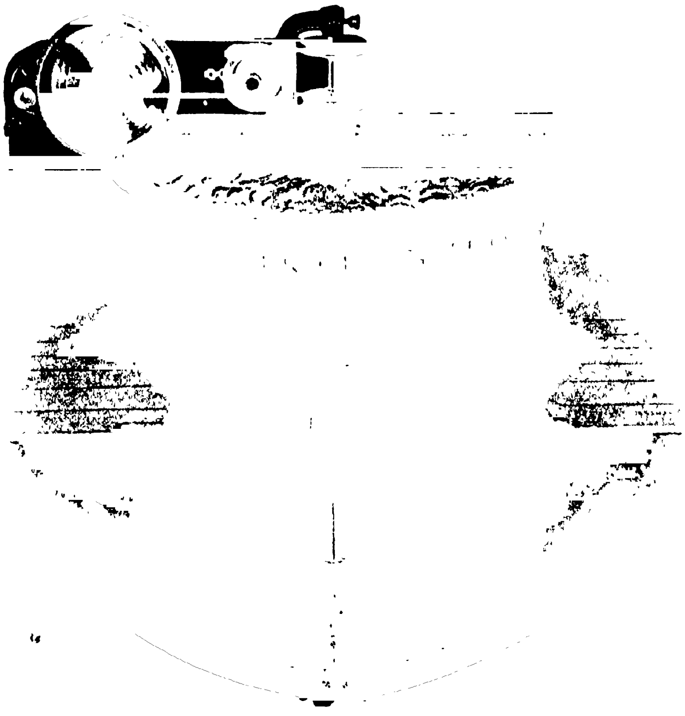
¾-horse-power will agitate 10,000 lbs. of oil.

Yields greatly increased; plant losses cut down; time of operation reduced.

Built for any sized tank; of acid resisting or non-acid resisting materials; direct connected to motor or for belt drive.

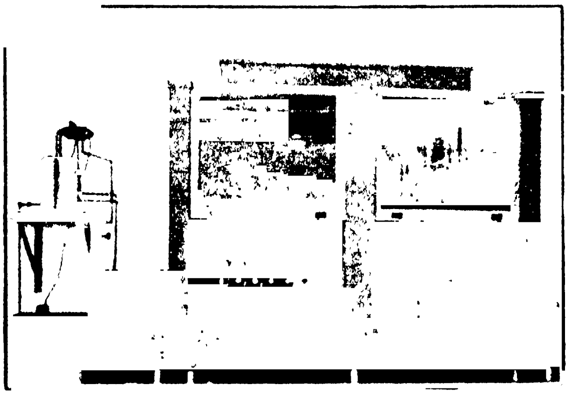


ALLBRIGHT-NELL SPECIAL OIL-TREATING TANK



ALLBRIGHT-NELL PERFECT CIRCULATOR

and gas-tight and a protection to the chemist and others at work in the laboratory By means of proper ventilation, fumes that are heavier than the atmosphere as well as those that are lighter, may be rapidly exhausted through the vent flue.



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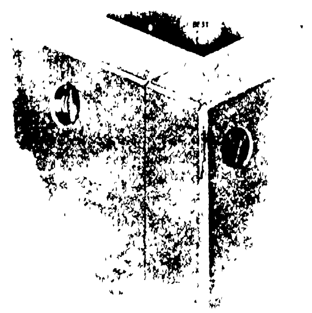
INSTALLATION

The Alberene Stone Company has assumed full responsibility for the delivery and erection of the equipment in the laboratories of the leading Industrial Plants and Universities, and, therefore by experience and through well-organized departments, is able to prepare details of all equipment and to carry out the installation under the supervision of its own mechanics These installations may be made upon foundations provided by the owners, or other contractors, or the Alberene Stone Company will assume a contract for the complete interior equipment of the laboratory, consisting of the table tops, reagent shelves, sinks, gutters, hoods, flooring and supports of pipe frames or cabinet work, if it is so desired The only items which are not included consist of the plumbing and ventilation connections and fittings.



TONGUED AND GROOVED, BOLTED JOINT

CARE OF EQUIPMENT

"Alberene Stone" can be kept clean and free from stains by washing, or by the use of sand-paper or sandstone Some chemists darken the stone by the use of oil or other preparations in order to give a uniform black finish For microscope tables an enamel paint may be applied, if desired.

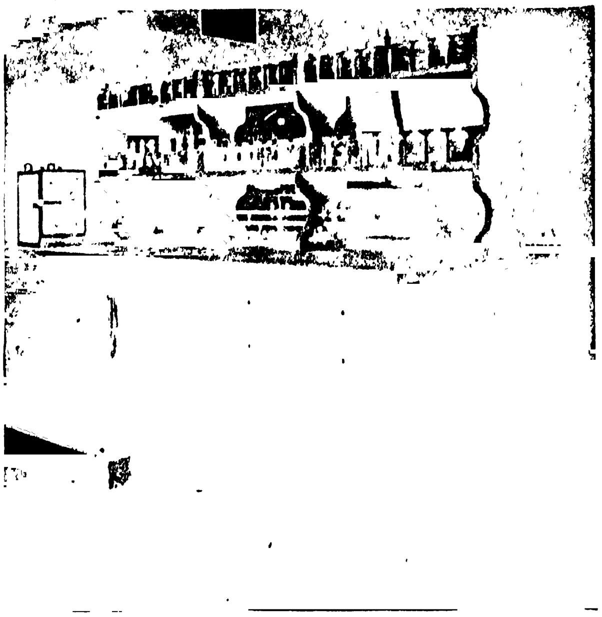
HEAT RESISTANCE

"Alberene Stone" is a fire stone, having a very low coefficient of expansion, and therefore withstands the heat in hood bases, and proves most satisfactory for the linings of smelting furnaces in the recovery process for sulphate, kraft and soda plants of the pulp and paper industry, and also for smelting furnaces in other industries where heat and chemical reactions create problems

USERS

The best evidence of the value of "Alberene Stone" and its resistance to the action of acid and alkali is to be found by the investigation of laboratories in which it has been in use for ten, twenty or more years. A few installations are listed below

Aluminum Co. of America
American Sugar Refining Co
Barrett Co
Bethlehem Steel Co
Catholic University of America
Chicago University
Columbia University
Cornell University
Crucible Steel Co.
E. I. du Pont de Nemours & Co.
General Chemical Co
Goodyear Tire & Rubber Co
Hills Bros Co
Jefferson Medical College
Johns Hopkins University
Lackawanna Railroad Co
Arthur D Little, Inc
Loose-Wiles Biscuit Co
Massachusetts Institute of Technology
Mellon Institute of Industrial Research
Merck & Co
National Biscuit Co
National Sugar Refining Co
New Jersey Zinc Co.
New York State Board of Health
Northwestern University
Pennsylvania Railroad
Princeton University
Queens University
Rockefeller Institute for Medical Research
Scovill Mfg Co
Southern Railway System
Standard Oil Co
Syracuse University
Tide Water Oil Co
Toronto University
U S Bureau of Chemistry
U. S. Bureau of Standards
U S. Bureau of Mines
U S Mints and Assay Offices
U S Navy Department
United States Rubber Co
U S Steel Corporation
U S War Department
Wilson & Co
Wooster University
Yale University



"ALBERENE STONE" TABLE TOP, REAGENT SHELVES WITH SUPPORTS, FLOORING AND BASE

NEW USES AND SERVICE

More than thirty years of experience enables the Alberene Stone Company to supply information concerning equipment and submit details and illustrations of a wide variety of installations Investigations are being continually made with the view to applying Alberene Stone to new uses We can readily adapt the equipment which we furnish to the special needs of research and laboratory operation. Samples will be furnished for tests. This company guarantees its products against defective material and workmanship.

AMERICAN ATMOS CORPORATION

Manufacturers of Self-contained Oxygen Breathing Apparatus

MEMBERS
National Safety Council

PITTSBURGH, PA.

NEW YORK OFFICE
105 West 40th Street

PRODUCTS

Self-contained Oxygen Breathing Apparatus; Respirators; Pulmotors and Oxygen Inhalators.

SELF-RESCUE TYPE

Light in weight, simple and easy to operate, readily adjustable to wear, folds compactly when not in use. Indispensable for quick service around industrial, chemical or refrigeration plants, as well as for municipal and government purposes where protection from gaseous atmosphere is essential.

SELF-RESCUE TYPE

ATMOS INDUSTRIAL MODEL (Type 32)

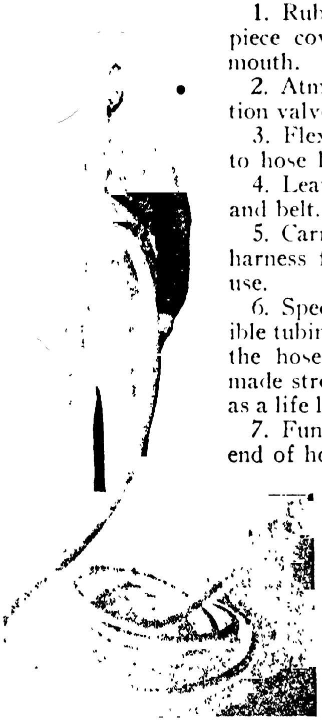
The first and only short-period, self-contained apparatus provided with the perfected oxygen control feed, which automatically adjusts itself to the requirements of the operator, preventing waste or excessive accumulation of oxygen. Positive pressure, compact, simple and light in construction.

ATMOS INDUSTRIAL MODEL (TYPE 32)

NEW ATMOS TUBULAR BREATHING MASK

Designed to provide for those industrial services requiring work in poisonous gases at short distances from fresh air and in which a simple, light and inexpensive apparatus is desired. Its essential features are:

1. Rubberized canvas face piece covering eyes, nose and mouth.
2. Atmos perfection respiration valve.
3. Flexible tube from valve to hose line.
4. Leather breast harness and belt.
5. Carrying bag on breast harness for mask when not in use.
6. Specially constructed flexible tubing or hose line. (Both the hose and connections are made strong enough to be used as a life line in emergency.)
7. Funnel with screen at free end of hose.
8. Steel stake with "S" hook attached to be used to anchor the free air end of the hose.
9. Special oxygen injector with gauge.
10. One hundred-ft. in 25-ft. lengths with couplings, specially constructed flexible tubing or hose line.



NEW ATMOS TUBULAR BREATHING MASK IN USE

STANDARD PULMOTOR

The Standard Type of Pulmotor guaranteed to supply adequate ventilation in cases of respiratory failure, whether from drowning, asphyxiation, by noxious fumes and gases, or in obstetrical emergencies.

STANDARD PULMOTOR

THE AMERICAN BRASS COMPANY

MAIN OFFICES
WATERBURY, CONN., U. S. A.

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Ansonia, Conn.

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Buffalo, N. Y.

Kenosha Branch
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Torrington Branch
Torrington, Conn.

Waterbury Branch
Waterbury, Conn.

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1026 Union Central Building

Philadelphia Pa
1401 Widener Building
Boston Mass
172 High Street
St Louis Mo
Security Building

Pittsburgh Pa
904 Union Bank Building
San Francisco, Cal
451 California Street

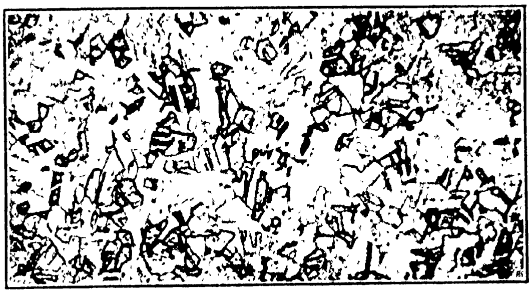
PRODUCTS

Brass, Bronze, Copper and Nickel Silver in all forms of Sheet, Wire, Rods and Tubes.

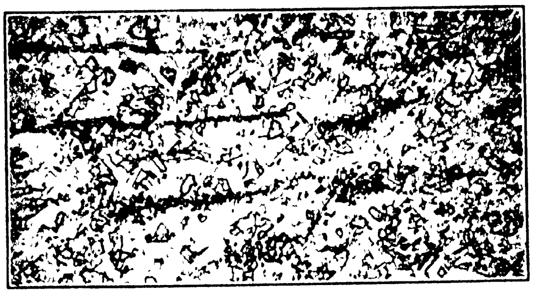
Special grades of non-ferrous alloys suitable for use in connection with the various chemical industries, including the manufacture of Explosives, Pulp and Paper, Tanning Extracts, Animal and Vegetable Compounds, Sugar, Salt, Etc.

Crucible cast and deoxided Copper Tubes and Pipes for Conductors, Heaters, Coolers and Evaporators.

COPPER TUBES



STRUCTURE OF ANNEALED COPPER TUBES MADE FROM CRUCIBLE CAST BILLETS



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Note the absence of Cuprous Oxide inclusions in the tube made from Crucible Cast Billets.

American Brass Copper Tubes are made entirely from crucible cast billets and can be depended upon to give maximum service under all conditions.

ADMIRALTY AND MUNTZ METAL TUBES

Tinned or untinned, for Condensers and Evaporators, finished by methods which insure their being of homogeneous material and giving extra long life in service.

SHEET COPPER AND COPPER PIPE

For stills and other chemical apparatus.

TOBIN BRONZE, PHOSPHOR BRONZE, MANGANESE BRONZE AND GUN METAL ALLOYS

For engineering uses which require non-ferrous materials of uniform high tensile strength as well as resistance to corrosion, oxidation and wear.

These Special Bronzes can be supplied in the form of Sheet, Wire, Rod and Tubes and have been used successfully for manufacturing

Coal Screen Plates
Condenser Tube Plates
Disc Valves for Pumps
Diaphragms
Plates and Bolts for Filtration Plants
Powder Mill Plates
Gun Powder Tools
Pump Piston Rods and Plungers
Valve Stems
Lining for Hydraulic Cylinders
Welding and Brazing stock
Magneto Parts
Marine instruments and apparatus
Scales for weighing Acid

FACILITIES

The mills of The American Brass Company are geographically located to insure prompt service to all important industrial sections of the country. These mills are equipped with extensive facilities for manufacturing a complete line of non-ferrous materials to meet the fullest requirements as to quality, finish, accuracy and dependability.

TECHNICAL DEPARTMENT

Special metallurgical problems regarding the use and adaptability of American Brass products for the chemical industry receive the attention of an efficient technical department, the service of which is available to all those interested.

Send for price lists and illustrated pamphlets.

THE RIGID INSPECTION OF ALL FINISHED MATERIALS, INCLUDING THE HYDRAULIC TESTING OF SEAMLESS TUBES IS ONE OF THE MANY PRECAUTIONS TAKEN TO SAFEGUARD THE INTERESTS OF AMERICAN BRASS CUSTOMERS

AMERICAN CAR AND FOUNDRY COMPANY

Manufacturers of Tank Cars for Chemicals

CHICAGO, ILL. 165 BROADWAY, NEW YORK, N. Y. ST. LOUIS, MO.

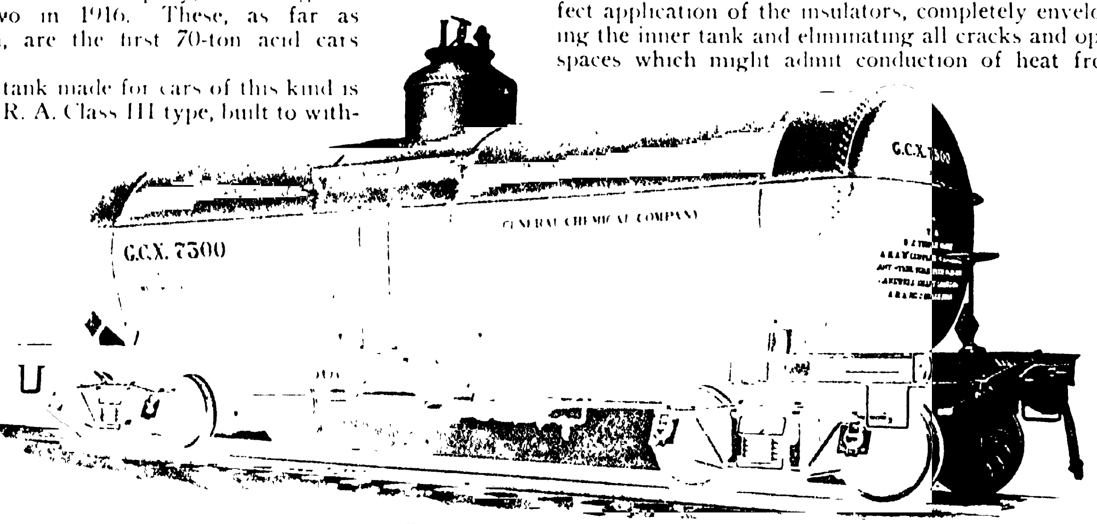
PRODUCTS

Tank Cars for all liquids and semi-solids, including sulphuric acid and other chemicals; Railway Cars of all types; etc.

SULPHURIC ACID TANK CARS

Tank Cars designed to carry dangerous chemicals are built with more than ordinary care in the American Car and Foundry Company's shops. A recent construction of this type is the sulphuric acid tank car illustrated below. Fifty of these 70-ton cars (9800 gallons capacity) have been purchased by the General Chemical Company, following an initial order for two in 1916. These, as far as known, are the first 70-ton acid cars built.

The tank made for cars of this kind is the A. R. A. Class III type, built to withstand a pressure of 300 pounds per square inch. It is made with three longitudinal sheets, which save several feet of riveted seams as compared with circular course construction, and this helps to eliminate any possibility of leakage. Both rivets and seams are caulked on the inside and the seams are also caulked on the outside. The average light weight of this sulphuric acid car is 50,400 pounds.



SULPHURIC ACID TANK CAR

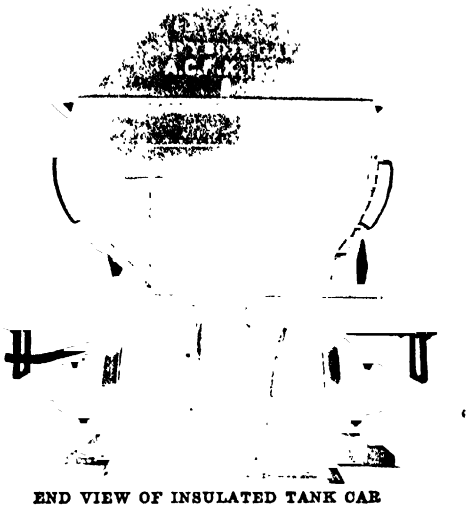
INSULATED TANK CARS

These cars are built to efficiently transport liquids which require protection from atmospheric temperatures.

Great care is exercised to obtain an isothermal container, not only in respect to the insulating materials used, and the form of construction, but most particularly in thorough workmanship which insures a perfect application of the insulators, completely enveloping the inner tank and eliminating all cracks and open spaces which might admit conduction of heat from the atmosphere to the contents of the tank, or permit loss of heat from the contents outward, as the case may be. Unless the inner tank is completely covered in this manner, the exposed surfaces defeat the insulating value of the non-conductors.

The car and inner tank construction in general conform to the standard "Car Foundry" Type 20, Class III, with the addition of special dome and fittings and tank lagging. This lagging consists of two courses of 2-ply weatherproof paper and two separate layers each of 1-inch hair felt, applied with all joints staggered and covered against any possible exposure of the inner tank. All the insulation is securely wired into place and protected by a jacket of ⅛-inch sheet steel. The jacket is ingeniously designed to prevent the admission of water and to permit the upper section, including the dome casing, to be removed easily in one piece from the bottom and head sections. The parts of each section are riveted together and the completed sections are provided at the edges with angles for bolting into place.

The tank is tested tight at 75 pounds hydrostatic pressure, and the entire car is built under the approval of the American Railway Association and the Bureau of Explosives.



END VIEW OF INSULATED TANK CAR

THE AMERICAN BRASS COMPANY

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Kenosha Branch
Kenosha Wis

Torrington Branch
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Waterbury Branch
Waterbury, Conn.

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Cleveland, Ohio
1118 Citizens Building

Detroit Mich
455 Book Building
Chicago Ill
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1026 Union Central Building

Philadelphia Pa
1401 Widener Building
Boston Mass
172 High Street
St Louis Mo
Security Building

Pittsburgh Pa
904 Union Bank Building
San Francisco, Cal
451 California Street

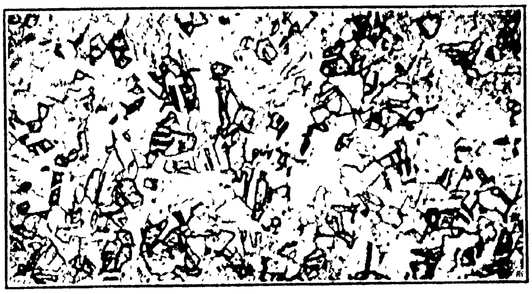
PRODUCTS

Brass, Bronze, Copper and Nickel Silver in all forms of Sheet, Wire, Rods and Tubes.

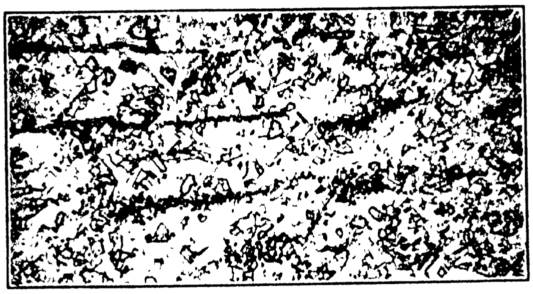
Special grades of non-ferrous alloys suitable for use in connection with the various chemical industries, including the manufacture of Explosives, Pulp and Paper, Tanning Extracts, Animal and Vegetable Compounds, Sugar, Salt, Etc.

Crucible cast and deoxided Copper Tubes and Pipes for Conductors, Heaters, Coolers and Evaporators.

COPPER TUBES



STRUCTURE OF ANNEALED COPPER TUBES MADE FROM CRUCIBLE CAST BILLETS



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ADMIRALTY AND MUNTZ METAL TUBES

Tinned or untinned, for Condensers and Evaporators, finished by methods which insure their being of homogeneous material and giving extra long life in service.

SHEET COPPER AND COPPER PIPE

For stills and other chemical apparatus.

TOBIN BRONZE, PHOSPHOR BRONZE, MANGANESE BRONZE AND GUN METAL ALLOYS

For engineering uses which require non-ferrous materials of uniform high tensile strength as well as resistance to corrosion, oxidation and wear.

These Special Bronzes can be supplied in the form of Sheet, Wire, Rod and Tubes and have been used successfully for manufacturing

Coal Screen Plates
Condenser Tube Plates
Disc Valves for Pumps
Diaphragms
Plates and Bolts for Filtration Plants
Powder Mill Plates
Gun Powder Tools
Pump Piston Rods and Plungers
Valve Stems
Lining for Hydraulic Cylinders
Welding and Brazing stock
Magneto Parts
Marine instruments and apparatus
Scales for weighing Acid

FACILITIES

The mills of The American Brass Company are geographically located to insure prompt service to all important industrial sections of the country. These mills are equipped with extensive facilities for manufacturing a complete line of non-ferrous materials to meet the fullest requirements as to quality, finish, accuracy and dependability.

TECHNICAL DEPARTMENT

Special metallurgical problems regarding the use and adaptability of American Brass products for the chemical industry receive the attention of an efficient technical department, the service of which is available to all those interested.

Send for price lists and illustrated pamphlets.

THE RIGID INSPECTION OF ALL FINISHED MATERIALS, INCLUDING THE HYDRAULIC TESTING OF SEAMLESS TUBES IS ONE OF THE MANY PRECAUTIONS TAKEN TO SAFEGUARD THE INTERESTS OF AMERICAN BRASS CUSTOMERS

AMERICAN FOUNDRY & CONSTRUCTION CO.

Power Piping
Engineers, Manufacturers, Contractors
PITTSBURGH, PA.

New York, N. Y., 460 Fifth Avenue
Chicago, Ill., 17 N. La Salle Street

PRODUCTS AND SERVICES

We Design, Manufacture and Install Complete Piping Systems for Power Plants and all Kinds of Industrial Plants.

We have had particularly wide experience in the installation of piping systems for steel mills, paper mills, chemical plants, refineries, etc.

We will gladly furnish estimates for your requirements, either f. o. b., your works ready for erection, or installed complete in accordance with plans and specifications.

Our engineering department has gained through broad experience a wide range of ideas covering the piping requirements of various industrial plants, and their services are at your disposal.

FACILITIES

Our manufacturing facilities consist of pattern shop, foundry, machine shop, pipe bending and fabricating shop and welding shop. We not only control delivery, but the quality of the materials we furnish.

Our erection department is made up of a corps of erecting engineers, specially trained for this class of work, and we can, therefore, relieve you of the many worries and details incidental to the installation of piping equipment.

VALVES

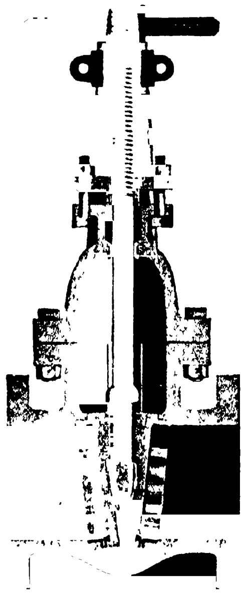
We manufacture all kinds of valves for pressures ranging up to 3000 lb. These valves are made of cast iron, cast steel and semi-steel with mountings to suit the service for which they are intended.

We also design and supply special valves for any service.

Our regular patterns include:

Gate Valves
Globe Valves
Blowoff Valves
Check Valves
Hydraulic Valves
Critchlow Operating Valves
Float Valves
Transfer Valves
Gas Line Valves
Drilling Valves
Cocks

The accompanying illustration shows the internal construction of our extra heavy gate valve with double adjustable discs and one piece stem. The body is made of semi-steel or cast steel, the stem and mountings of bronze or Monel metal as required.

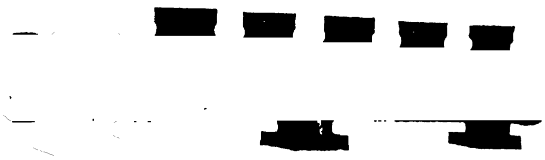


SECTIONAL DETAIL
Showing interior construction
extra heavy gate valve

FITTINGS

We manufacture flanged and screwed fittings for any service or pressure, made of cast iron, cast steel or semi-steel. Our fittings, unless otherwise specified, are made in accordance with the "Manufacturers" or the "A. S. M. E." standard specifications.

Special fittings of any kind furnished upon request.



SPECIAL SEMI-STEEL MANIFOLD

Continued on Next Page

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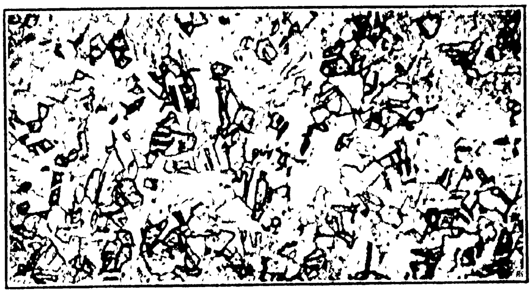

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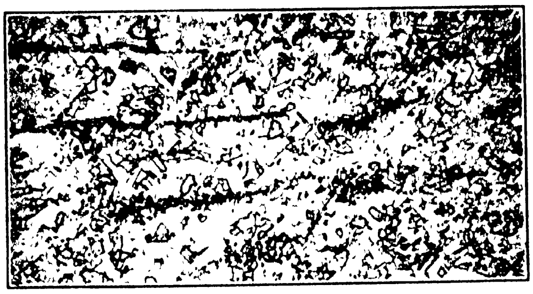

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AMERICAN HARD RUBBER COMPANY

Manufacturers of Hard Rubber Products

GENERAL OFFICES: 11 MERCER STREET, NEW YORK, U. S. A.

BRANCHES

Chicago Akron London Paris

FACTORIES

Akron, O Butler, N J College Point N Y New York, N Y

PRODUCTS

Hard Rubber pumps, pipe and fittings for the conveyance of acids, alkalis, dyes, food products, or other materials where chemical inertness is essential.

Tanks for acid storage, pickling, plating, etching, etc.

Utensils such as dippers, bottles, funnels, pails, measures, dipping baskets, frames, etc.

All kinds of special parts to specifications, with or without metal inserts.

Storage battery jars and parts, electrical insulators, etc., metal covered fans, centrifugals, frames, rollers, etc.

Hard Rubber rod, sheet and tubing.

HARD RUBBER CHEMICAL EQUIPMENT

The remarkable inertness of Hard Rubber in the presence of the most violently corrosive liquids makes it an ideal material to use in the construction of chemical equipment. Many years of painstaking development were necessary to produce the special compounds and processes which are being successfully used today. It is now possible to furnish complete installations including tanks, pumps, piping, and the usual fittings, of this material. Contamination of solutions, replacements due to corrosion and their attendant losses in quality and efficiency are minimized and frequently eliminated by the installation of Ace quality Hard Rubber equipment.

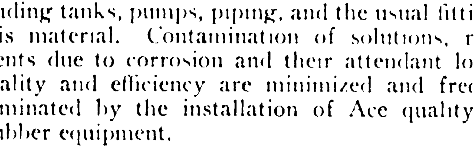
Chemical engineers trained and experienced in this field are prepared to furnish data, estimates, and specific recommendations on such equipment.

CHEMICAL PROPERTIES OF HARD RUBBER

Hard Rubber finds its greatest application in connection with hydrochloric and hydrofluoric acids, chlorine, and bleaching solutions, acetic acid, and vinegar products, alkalis, and electrochemical liquors. There are very few chemicals which attack Hard Rubber, and to insure satisfactory service from installations, a completely equipped chemical and physical laboratory is maintained for testing and developing compounds for use with special liquors.

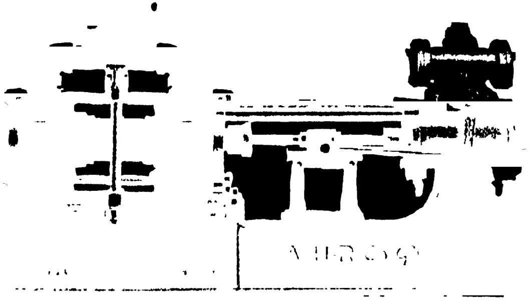
HARD RUBBER PUMPS

All parts coming in contact with the liquid in its passage through these pumps, are of our special acid-resisting hard rubber. Conventional practise has been followed throughout in their design, and they will be found sturdy and practical in hard service.



SINGLE ACTING PUMP

Double acting pumps are made in five sizes and single acting in three. All the former may be furnished as direct acting steam pumps, with the well-known Davidson steam end, or fitted for belt or electric drive as shown on the accompanying table.



DOUBLE ACTING STEAM DRIVEN PUMP

TABLE OF SIZES OF RECIPROCATING PUMPS

Type	Bore, In.	Stroke, In.	Capacity, G. P. M.	R. P. M.	Suction Pipe, In.	Discharge Pipe, In.	Steam Pipe, In.	Exhaust Pipe, In.	Drives
				Double Acting					
MA	2½	4	12	150	1½	1¼	⅜	½	Steam & Elec.
MB	3	4	18	150	1½	1¼	⅜	¾	Steam, Belt & Elec.
MC	3	6	27	150	2	1½	½	¾	Steam, Belt & Elec.
MD	4	8	50	115	2½	2	¾	1	Steam, Belt & Elec.
MF	6	10	122	100	3	2½	1	1¼	Steam & Belt
				Single Acting					
JA	2	6	6	75	1¼	1	..	..	Hand, Belt & Elec.
JB	3	6	10	60	1¼	1	..	..	Hand, Belt & Elec.
JC	3	8	14	60	1¼	1	..	..	Belt only

HARD RUBBER CENTRIFUGAL PUMPS

This is our most popular pump and is admirably adapted for low head work.

It will deliver 65 gallons per minute against a five foot head or 28 gallons against a 20 foot head. It is always supplied with motor directly mounted on pump frame, and any power characteristics may be obtained.

Write for Bulletin 10-A.

HARD RUBBER PIPE AND FITTINGS

Hard Rubber Pipe and Fittings are all made of our special acid-resisting hard rubber. Being the same material inside, outside, and all the way through, there is no possibility of fumes, or drippings attacking the exterior of the pipe, nor can corrosion work around the lining at joints and cause invisible and dangerous weaknesses.

Briggs Standard as used on ordinary pipe is adhered to on outside diameters and threads. The wall thickness is increased slightly for

CENTRIFUGAL PUMP

Continued on Next Page

THE AMERICAN BRASS COMPANY

MAIN OFFICES

WATERBURY, CONN., U. S. A.

MILLS AND FACTORIES

Ansonia Branch,
Ansonia, Conn.

Buffalo Branch
Buffalo, N Y

Kenosha Branch
Kenosha Wis

Torrington Branch
Torrington, Conn.

Waterbury Branch
Waterbury, Conn.

OFFICES STORES AND RESIDENT AGENTS

New York, N Y
195 Broadway
Providence, R I
131 Dorrance Street
Cleveland, Ohio
1118 Citizens Building

Detroit Mich
455 Book Building
Chicago Ill
29 East Madison Street
Cincinnati, Ohio
1026 Union Central Building

Philadelphia Pa
1401 Widener Building
Boston Mass
172 High Street
St Louis Mo
Security Building

Pittsburgh Pa
904 Union Bank Building
San Francisco, Cal
451 California Street

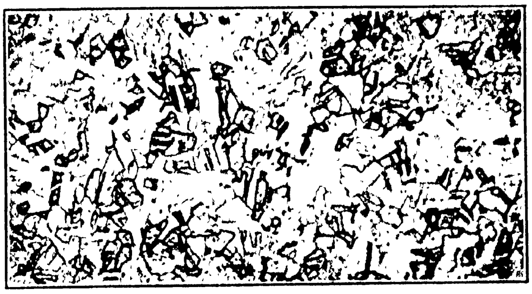
PRODUCTS

Brass, Bronze, Copper and Nickel Silver in all forms of Sheet, Wire, Rods and Tubes.

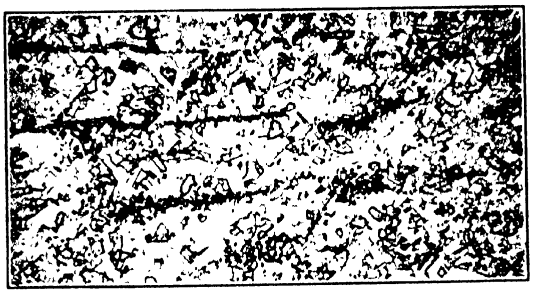
Special grades of non-ferrous alloys suitable for use in connection with the various chemical industries, including the manufacture of Explosives, Pulp and Paper, Tanning Extracts, Animal and Vegetable Compounds, Sugar, Salt, Etc.

Crucible cast and deoxided Copper Tubes and Pipes for Conductors, Heaters, Coolers and Evaporators.

COPPER TUBES



STRUCTURE OF ANNEALED COPPER TUBES MADE FROM CRUCIBLE CAST BILLETS



STRUCTURE OF ANNEALED COPPER TUBES MADE FROM REVERBERATORY FURNACE CAST BILLETS

The above Micrographs illustrate the fundamental superiority of Copper Tubes made from Crucible Cast Copper Billets over those made from Reverberatory Furnace Cast Billets.

Note the dark streaks in the tube made from Reverberatory Furnace Cast Billets. These streaks indicate the presence of Cuprous Oxide which hastens corrosion and results in the tube becoming pitted more rapidly than if it was free from oxide.

Note the absence of Cuprous Oxide inclusions in the tube made from Crucible Cast Billets.

American Brass Copper Tubes are made entirely from crucible cast billets and can be depended upon to give maximum service under all conditions.

ADMIRALTY AND MUNTZ METAL TUBES

Tinned or untinned, for Condensers and Evaporators, finished by methods which insure their being of homogeneous material and giving extra long life in service.

SHEET COPPER AND COPPER PIPE

For stills and other chemical apparatus.

TOBIN BRONZE, PHOSPHOR BRONZE, MANGANESE BRONZE AND GUN METAL ALLOYS

For engineering uses which require non-ferrous materials of uniform high tensile strength as well as resistance to corrosion, oxidation and wear.

These Special Bronzes can be supplied in the form of Sheet, Wire, Rod and Tubes and have been used successfully for manufacturing

Coal Screen Plates
Condenser Tube Plates
Disc Valves for Pumps
Diaphragms
Plates and Bolts for Filtration Plants
Powder Mill Plates
Gun Powder Tools
Pump Piston Rods and Plungers
Valve Stems
Lining for Hydraulic Cylinders
Welding and Brazing stock
Magneto Parts
Marine instruments and apparatus
Scales for weighing Acid

FACILITIES

The mills of The American Brass Company are geographically located to insure prompt service to all important industrial sections of the country. These mills are equipped with extensive facilities for manufacturing a complete line of non-ferrous materials to meet the fullest requirements as to quality, finish, accuracy and dependability.

TECHNICAL DEPARTMENT

Special metallurgical problems regarding the use and adaptability of American Brass products for the chemical industry receive the attention of an efficient technical department, the service of which is available to all those interested.

Send for price lists and illustrated pamphlets.

THE RIGID INSPECTION OF ALL FINISHED MATERIALS, INCLUDING THE HYDRAULIC TESTING OF SEAMLESS TUBES IS ONE OF THE MANY PRECAUTIONS TAKEN TO SAFEGUARD THE INTERESTS OF AMERICAN BRASS CUSTOMERS

AMERICAN HUHN METALLIC PACKING CO.

Largest Manufacturers of Metal Packing in the World

WOOLWORTH BLDG., NEW YORK, N. Y.

BRANCHES

Montreal, Detroit, Pittsburgh, Cincinnati, Oklahoma City, San Antonio, New Orleans, Los Angeles, San Francisco, Seattle, Calgary, Minneapolis, Chicago, Denver.

PRODUCTS

Special Metal Packing for any movement, for any temperature, or speed, or pressure; for all conditions of service, for the stuffing-boxes of all packing-requiring machinery.

USED IN EVERY INDUSTRY

Chemical Manufacturers, viz: Borax, Bleach, Cement, Coal Tar, Colors, Dyestuffs, Explosives, Glue, Match, Nitrate, Paint, Varnish, etc; Coal and Coke Cos, Manufacturers of Food Products, and Fertilizers; Gas and Utility Corporations; Manufacturers of Glass and Ceramics, and Iron and Steel; Mining and Smelting Cos; Paper and Pulp Mills, Power Stations (steam, hydro, and electric); Refineries, Refractories, and Refrigerating Plants, viz.: Air Conditioning, Beverage and Brewing, Canning, Chicle, Cold Storage, Confectionery, Dairy, Fisheries, Ice Cream, and Ice Manufacturers, Maltsters, Packing Houses, Pre-Cooling Stations, and Manufacturers of Syrups, Vinegar, Yeast, etc.

FOR EVERY CLASS OF EQUIPMENT

- Accumulators
- Autoclaves
- Blowers
- Compressors
  - air (all stages)
  - ammonia
  - CO_2
  - chlorine
  - gas gasoline
  - expander
  - hydrogen
  - oxygen, etc.
- Digesters
- Engines
  - slide
  - 4-valve: corliss
  - poppet: uniflow
  - blowing
  - Diesel
  - marine
  - pumping, etc
- Presses (oil: hyd)
- Pumps
  - ammonia
  - brine
  - centrifugal
- Pumps (cont.)
  - chemical
  - feed
  - oil
  - water
  - vacuum
  - tar
- Locomotives
- Valves
  - air
  - automatic
  - chemical
  - steam

EXPLANATION OF PACKING PRINCIPLE

In all other designs, including fibrous, semi-metallic, and metallic, the pressure of the packing around the rod admittedly increases as the tendency to leakage, or the operating pressure, increases; and in direct consequence, the rods become seriously scored, and gradually tear each new set of packing to pieces. In contrast, the construction of the Huhn Ring resists the effect of pressure and blocks leakage without gripping the rod.

By eliminating, with Huhn, the unnecessary packing friction on the rod, (1) the life of the rod is increased considerably, (2) the motive power is relieved of a friction-load easily measurable in several horsepower, (3) full pressure and vacuum are readily sustained, and (4) the total savings added (5) to the long life of Huhn, make annual packing costs ridiculously low.

THE HUHN SEAL

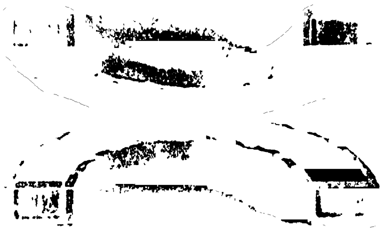
Means are provided, as shown in the cut, for the auto-feeding of graphite (or other suitable lubricant) from the reservoir of each Huhn Ring, and as none of this internal lubrication is lost either into the system or out of the stuffing-box to the atmosphere, the supply lasts indefinitely, and installations running 5, 10 and even 12 years are not uncommon.

The entire effect of the Huhn Reservoir System is to establish an internal lubricant seal, through which rods, stems, and plungers float freely and easily without packing drag, or resistance.

APPROVED DESIGNS

Years of successful service, handling ordinary and extreme conditions in every part of the world,—from vacuum to 5,000 lbs. pressure; from superheat to liquid ammonia; from expansion joints to high speed units—have fairly established the company and its product in the minds of the leading engineers in all branches of the industry. Our recommendations on new designs of equipment are sought and accepted, and our product has been rapidly standardized.

The Huhn Principle—From this basic ring more than 40 special packing designs have been produced, each on the principle of sealing the stuffing-box, in contrast with the old-fashioned idea of preventing leakage by jamming a packing against the rod or plunger.

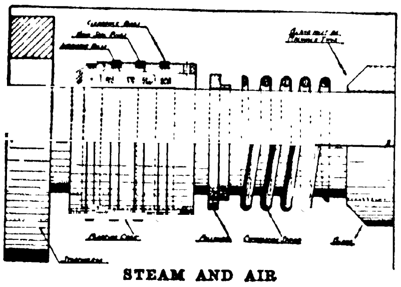


HUHN RING SAWED IN SECTION

Famous for Years—This is the Huhn ring which will withstand any temperature, pressure or speed on any compressor without wear on the rod or packing.

NH_3, CO_2, AND OTHER GASES

"Float-Cage"—In this style, the Huhn rings are contained in a cage which follows the rod at all times. For chemicals, oils and other conditions, there are other Huhn types, each for special requirements.



STEAM AND AIR

CONSULTATION

We are primarily packing engineers and will consider it a privilege to discuss any special packing problems. The wide variety of liquids, handled at high temperatures in the industrial chemical field, require certain designs for which Huhn is especially fitted, and our experience is entirely at the disposal of all engineers in charge of design, construction, and operation of simple or involved apparatus.

CONTRACT WORK

Our engineers are able to analyze the requirements of the complete plant, and will submit recommendations and proposals and guarantees on request. Simply advise full details.

AMERICAN LEAD BURNING CO., Inc.

FORMERLY MOORE AND SIMONSON

Lead Burning Contractors

Hudson Terminal Building
30 Church Street, NEW YORK, N. Y.

PRODUCTS

Lead and Lead Lined Equipment, Standard and Special.

Entire lead installations at plant location.

Expert Lead Burning for Chemical and Allied Industrial Plants.

Also consulting and designing for work in our field.

Repair and replacement and plant maintenance work.

Simonson-Mantius Sludge Acid Recovery Process, for which see pages of Mantius Engineering Co., Inc.

We have had considerable experience on the following work:

PLANTS

- Sulphuric Acid Plants
  - Contact Process
  - Chamber Process
- Acid Concentrators
  - Pan Type
  - Tower Type
  - Simonson-Mantius Process
- By-Products Coke Plant
  - Saturators, etc
- Pulp and Paper Plants
  - Cooling Systems
  - Digestors
- Metal Refining Plants
  - Electrolytic Tanks
  - Launder Systems
  - Leaching Tanks
- Oil Refining Plants
  - Agitators
  - Sulphonators
- Chemical Plants
  - Varied Installations
  - Varied Equipment
- High Explosive Plants
- Fertilizer Plants
- Bleaching Plants
- Dye Plants

EQUIPMENT

- Agitators
- Mixing Kettles
- Sulphonators
- Coolers
- Condensers
- Centrifugals
- Acid Eggs
- Blow Cases
- Kettles
- Stills
- Pans
- Blowers
- Pumps
- Scrubbers
- Coils
- Tanks
- Towers
- Saturators
- Digestors
- Vacuum Evaporators
- Pipe
- Valves
- Special Apparatus

SERVICES

We are equipped and organized to undertake lead work of any character whatever throughout the United States and Canada The mechanics we employ are the highest grade men of long and thorough experience and we guarantee all workmanship to be the best that it is possible to turn out We can undoubtedly be of considerable help to firms in the laying out of their lead work and the experience we have gained in many plants may be of particular benefit to those who may require our services.

A FEW CLIENTS

For those who inquire as to what we have done as well as what we can do we present the names of clients, many of them well known. We cheerfully solicitate investigation as to the character of our work from them.

B. T. Babbitt Co.	Babbitt, N. J.
United Tube Co.	Belleville, N. J.
Seaboard By-Products Coke Co.	Kearny, N. J.
John Yocum	Irvington, N. J.
Buffalo Foundry & Machine Co	Buffalo, N. Y.
G. D. Jenssen Co	New York, N. Y.
National Electrolytic Co	Niagara Falls, N. Y.
Pierce Company	Rochester, N. Y.
Anodhan Metals Co	Baltimore, Md.
Newport Chemical Co.	Passaic, N. J.
American Can Co.	Edgewater, N. J.
H. Koppers Co.	Jersey City, N. J.
Westmoreland Coal Co.	Irwin, Pa.
United Lead Co.	New York City
Snead Iron Works	Jersey City, N. J.
Nitro Chemical Co.	Kingsland, N. J.
Pyrene Mfg Co.	New York, N. Y.
Curtiss Aero Co.	Garden City, N. Y.
E. A. Stevenson Co	Boonton, N. J.
National Aniline & Chem. Co	Brooklyn, N. Y.
M. E. Gillett & Son	Tampa, Fla.
Zinsser & Company	Hastings, N. Y.
Granby Cons Min , Smelt & Pr. Co.	Anyox, B C.
Chas. C. Moore & Co	San Francisco, Calif.
Penman Littlehales Co	Syracuse, N. Y.
L. Sonneborn Sons Co	Belleville, N. J.
Aetna Explosives Co	New York, N. Y.
Aetna Explosives Co	Mt. Union, Pa.
Aetna Explosives Co	Emporium, Pa.
Aetna Chemical Co.	Drummondville, P. Q.
Bigelow & Nichols	New York, N. Y.
Richards & Co	Stamford, Conn.
Frank Hemingway, Inc	Bound Brook, N. J.
Monongahela Valley Traction Co	Fairmont, W. Va.
Wasson Piston Ring Co	New Brunswick, N. J.
Stevens-Aylsworth Co.	New York, N. Y.
Algoma Steel Corp'n	Sault Ste Marie, Ont.
Nitro Powder Co	Kingstown, N. Y.
Bayway Chemical Co.	Bayway, N. J.
Acme Tank Co.	New York, N. Y.
Otto Coking Co , Inc.	New York, N. Y.
Melco Chemical Co.	Bayonne, N. J.
Bush & Co.	Linden, N. J.
Melrose Chemical Co.	Newark, N. J.
Foundation Company	New York, N Y.
Columbus Crystal Co.	Newark, N. J.
Capitol Chemical Co	New York, N. Y.
Consolidated Color & Chem. Co.	Newark, N. J.
E. C. Klipstein Co.	Charleston, W. Va.
F. Bredt & Co.	New York, N. Y.
Scoville Mfg. Co.	Waterbury, Conn.
American Color Mfg. Co.	Passaic, N. J.
International Nickel Co.	Port Colborne, Ont.
Harrison Chemical Co.	Newark, N. J.
American Synthetic Dyes Co.	Newark, N. J.
Arlington Co.	Newark, N. J.
Synthetic Chemical Co.	Newark, N. J.
Merck & Co.	Rahway, N. J.
Armour Fertilizer Works	Chrome, N. J.
Calco Co	Bound Brook, N. J.
U. S. Smelting & Refining Co.	Chrome, N. J.
Morris Fertilizer Co	Atlanta, Ga.
Island Refining Co.	Prospect, La.
Butterworth-Judson Co.	Newark, N. J.
Mass. Oil Refining Co.	Boston, Mass.
Raritan Refining Co.	Greensand, N. J.
Carthage Sulphite Pulp & Paper Co.	Carthage, N. Y.
Union Miniere du Haut Katanga	New York, N. Y.
United States Government	Puget Sound, Wash.
United States Government	Willoughby, Ohio
United States Government	Edgewood, Md.
Dymalkon Metals Co.	New York, N. Y.
L. A. Riley	New York, N. Y.
Warner-Klipstein Co.	Chrome, N. J.
Gas & Coke Oven Corp'n of America	New York, N. Y.

AMERICAN MACHINERY COMPANY, INC.

Manufacturers of Weighing and Filling Machinery NEW YORK OFFICE
MAIN OFFICE AND FACTORY 799 BROADWAY
330-318 NORTH 12TH STREET, PHILADELPHIA, PA.

PRODUCTS

Machines for automatically weighing and filling all dry, semi-pastes, paste and crystal compounds.

SERVICE

We will gladly send our engineering experts to consult with you on your problems of weighing and filling all classes of materials.

LITTLE WONDER SCALE

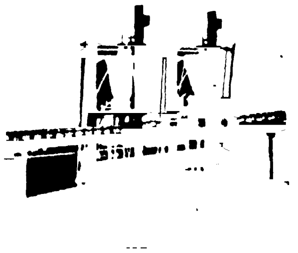
"LITTLE WONDER" AUTOMATIC SCALE

This machine is designed to handle free flowing powders and crystals of light gravity. One operator can handle 1500-1800 packages per hour with ease. The feeder device can be instantly set for 14 different speeds. Capacity from 2 oz. to 1 lb. per charge in weighing hopper for model No. 1, to 6 lbs. per charge for Model 2. Two other sizes which are larger are special machines. All four sizes are net weight machines.

AMERICAN AUTOMATIC SCALES MODEL K-1 GROSS WEIGHT

This machine is used for products that are hygroscopic and require rapid filling and large spout-room to prevent packing. The illustration below shows the machine in operation filling Caustic Soda into containers.

MODEL K-1



MODEL K-2

"AMERICAN" AUTOMATIC SCALES MODEL K-2 GROSS WEIGHT

This machine is similar to K-1, except that it is used where the material does not pack tight and has to be jarred to make it settle, and then a second filling is necessary to give the exact full weight. The first machine fills the container in a large stream, while the second, or finishing scale, completes the weighing by filling in a small stream.

AMERICAN TOP AND BOTTOM CARTON SEALER

The most inexpensive, simplest in construction and practical machine ever produced.

Capacity 35 filled and sealed cartons per minute.

"AMERICAN" AUTOMATIC SCALE MODEL B

A net weight machine rated at 1200 to 2000 packages per hour according to size. It has adjustment for 20 different speeds of feeding. This machine can be equipped with a compressor device for packing into canisters or solid bricks and is adjustable to all shapes and sizes of containers; ¼ H.P. required, and floor space 33 inches by 33 inches.

MODEL B IN CONJUNCTION WITH ENVELOPE SEALER

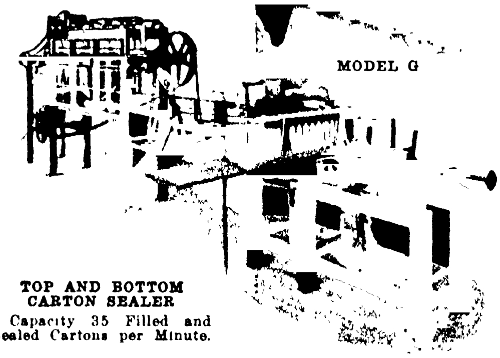
"AMERICAN" ENVELOPE AND BAG SEALER

Combination Equipment and weighs, fills, seals samples of all kinds of products such as drugs and pharmaceuticals, food products, perfumes, seeds, etc. Capacity 25 to 30 envelopes or bags per minute with one operator.

"AMERICAN" UNIVERSAL ELECTRIC WEIGHER AND FILLER MODEL G

A gross weight machine for a wide variety of products, in all types of containers, such as foods, spices, talcs, drugs, and all powdered or fine granulated goods, under high pressure or none. ½ H.P. and floor space 3 feet by 3 feet, capacity about 30 packages a minute.

MODEL G



TOP AND BOTTOM CARTON SEALER
Capacity 35 Filled and Sealed Cartons per Minute.

AMERICAN MANGANESE BRONZE COMPANY

Manufacturers of

High Grade Bronzes for Engineering Purposes

HOLMESBURG, PHILADELPHIA, PA.

Cleveland, 1006 Guardian Bldg   Detroit 1714 Woodward Ave.   Pittsburgh 316 House Building   Montreal, 285 Beaver Hall Hill

PRODUCTS

- **Bronze Castings**
  - **Ingots**
  - **Forgings**
  - **Rolls**
  - **Rods**
  - **Shapes**
  - **Hydraulic and Acid Resisting Bronzes.**

HY-TEN-SL BRONZE

Is the strongest of all bronzes, being about equal to Nickel Steel. It is a homogeneous alloy of close, even texture and can be readily cast into difficult shapes. It can be forged, rolled or extruded hot. It is non-magnetic and non-corrosive.

MANGANESE BRONZE

Where a combination of strength and acid resistance is required, Manganese Bronze is the ideal Metal. No other Bronze withstands the action of Acetic Acid as well as does Manganese Bronze.

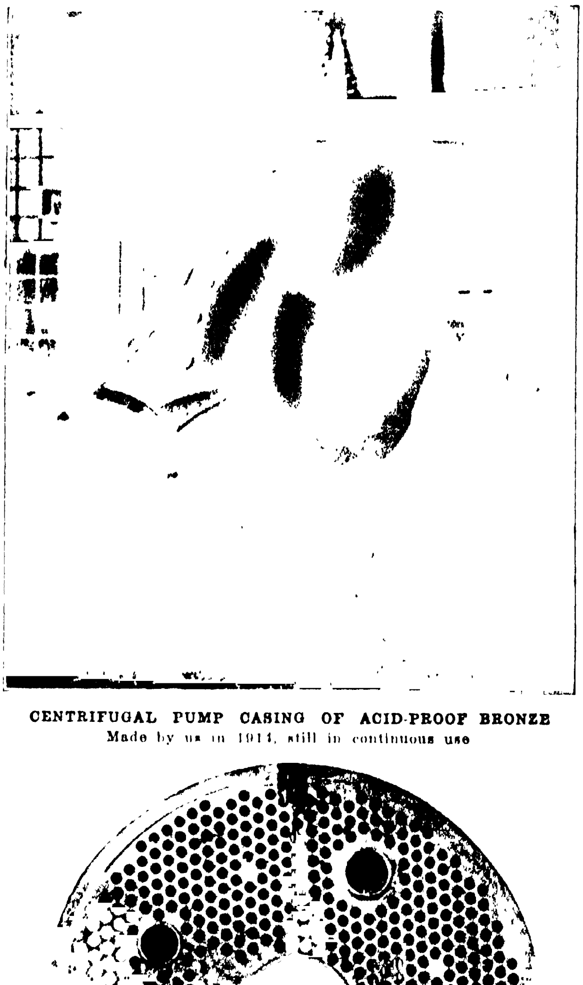
Our Manganese Bronzes show a uniform grain; they are tough, ductile and non-corrosive, with the equivalent tensile strength and elongation of medium carbon steel. Forging and rolling increase the yield point and produce a fibrous structure. Intricate castings can be poured from this metal.

ACID RESISTING BRONZE

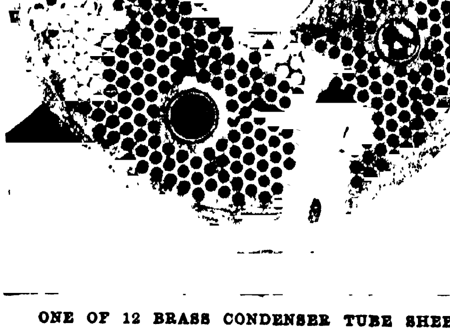
Our acid resisting bronze is made to withstand the action of weak Sulphuric Acid; this makes it especially valuable where such a condition is to be met.

AVERAGE PHYSICAL PROPERTIES OF SPARE'S BRONZES
In Tension

Grade of Bronze	Form	Tensile Strength per Sq Inch in Pounds	Yield Point per Sq Inch in Pounds	Elongation in 2 Inches %	Reduction of Area %
HY-TEN-SL Bronze . .	Castings	105,000	60,000	15.0	15.0
HY-TEN-SL (Gear) . ..	Castings	90,000	42,000	20.0	20.0
Manganese SMB	Castings	70,000	35,000	30.0	30.0
Manganese AMB	Castings	62,000	30,000	25 0	25 0
Naval	Rolled and Forged	54,000	25,000	40.0	45.0
Phosphor No. 1	Castings	25,000	18,000	4.0	30.0
U S. Gov't Gun	Castings	40,000	20,000	20.0	20 0
Acid Resisting.	Castings				



CENTRIFUGAL PUMP CASING OF ACID-PROOF BRONZE
Made by us in 1914, still in continuous use



ONE OF 12 BRASS CONDENSER TUBE SHEETS
Made by us. Diameter—13' 9". Weight 5000 lbs.

THE AMERICAN METAL HOSE COMPANY

WATERBURY, CONN.

SALES OFFICES

Canada
Lytle Engineering Co., Limited
Montreal, Canada

84 Batterymarch St., Boston, Mass
173 Lafayette St., New York City

29 East Madison St., Chicago, Ill
Union Bank Building, Pittsburg, Pa

Pacific Coast:
F. Somers Peterson Co
San Francisco, Cal

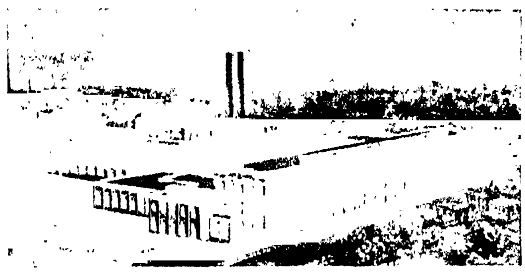
PRODUCTS

American Flexible Metal Hose and Tubing, for

Oil	Gasoline
Steam	Paint
Air	Varnish
Gas	Etc.

MANUFACTURING FACILITIES

With 50,000 ft. of floor space devoted exclusively to the manufacturing of **American Flexible Metal Hose,** with the most modern types of equipment obtainable, and with large stocks of finished Hose at all times on hand, we are in a position to render service par excellence.



FACTORY: WATERBURY, CONN.

ADAPTABILITY

While adapted to all Hose duties, **American Flexible Metal Hose** is primarily a heavy service Hose, and its principal fields are in the hardest and most severe classes of work. Its economy and efficiency are most pronounced in those duties where rubber hose on account of chemical action or intense heat can at best last but a very short time. We, unqualifiedly, recommend our Hose for the conveying of Oils, Steam, Air, Gas, Gasoline, Paints, Varnish, etc.

STEAM HOSE

American Flexible Metal Steam Hose, BD15 and BD20 Bronze is used for the conveying of Steam in numberless connections. It won't rot; it can't burn out; neither heat nor pressure affects it. Principal uses. Blowing Boiler Tubes; General Conducting of Steam and as Flexible Joints on Steam Presses.

OIL HOSE

Our **Oil Hose** is of the same construction as the Hose we furnish for Steam but it is made of heavily **Galvanized Steel** instead of Bronze. It is cheaper than the best grades of rubber oil hose and will last indefinitely longer.

UNLOADING TANK CAR WITH AMERICAN METAL OIL HOSE

American Metal Oil Hose is absolutely immune to the action of Oils. All Oil Companies use it; the U. S Navy Department uses Flexible Metal Oil Hose exclusively.

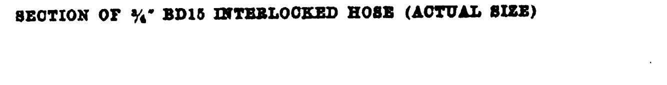
HOSE PROBLEMS

Most hose problems are simple; a large percentage arise from the use of unsuitable hose. We can help you in any Hose problems you may have; our experience is at your disposal.

TEST TABLE: BD15 FLEXIBLE BRONZE HOSE

Diameters of Hose, in		Approximate bending diameter, in	Weights per foot, lbs	Test Pressures per sq in —lbs	
Inside	Outside			Straight	Bent
¼	[illegible]	4	11	500	400
⅜	[illegible]	6	25	500	400
½	[illegible]	7	40	500	400
¾	[illegible]	12	80	500	400
1	1¼	14	1 00	500	400
1¼	1[illegible]	18	1 50	400	300
1½	1[illegible]	22	1 75	400	300
2	2[illegible]	26	2 75	300	200
2½	2[illegible]	32	3 15	250	150
3	3⅞	38	4 50	250	150
4	4 7/16	44	6 75	200	75
5	5 7/16	50	8 75	200	75
6	6[illegible]	56	11 00	150	75

Steel Hose is approximately 10% lighter than Bronze
(Above test pressures are from latest U. S. Naval specifications on flexible metal hose and are used by us as standard)



SECTION OF ¾" BD15 INTERLOCKED HOSE (ACTUAL SIZE)

AMERICAN PLATINUM WORKS

Platinum, Gold and Silver Refiners

Manufacturers of Finest Quality Laboratory Ware

225-231 N. J. R. R. AVE., NEWARK, N. J.

NEW YORK OFFICE, 30 CHURCH STREET

PRODUCTS

Platinum for all purposes as required by chemists and allied lines: Metallurgists, Chemical Supply Houses and Manufacturers: Platinum Laboratory Apparatus of Standard and Special Design. Platinum Metal Salts. Gold and Silver.

Palladium and all metals of the platinum group.

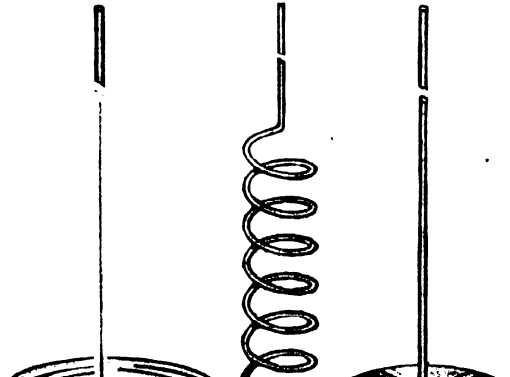
PLATINUM CRUCIBLES

Standard weights and sizes in stock. The use of finest grade metals assures a product free from defects, permitting maximum results with minimum labor. We also manufacture special shapes and sizes to order, including crucibles of Gold or Silver and Goldlined Platinum Crucibles.

CRUCIBLE

ANODES AND CATHODES

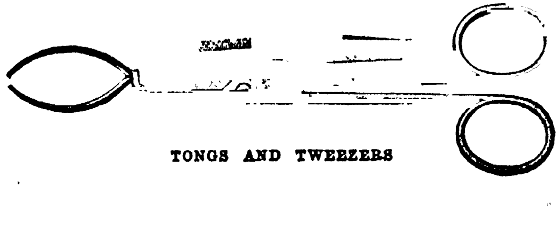
Made of finest quality platinum in all standard sizes and shapes and to order.



ANODES AND CATHODES

TONGS, TWEEZERS, ETC.

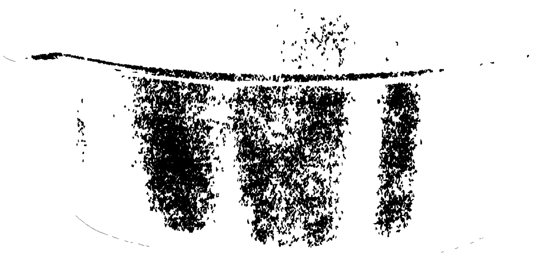
Nickel Crucible Tongs, with solid or hollow platinum tips. Finest quality throughout. Platinum tipped tweezers of various types, also standard sizes of platinum spatulas.



TONGS AND TWEEZERS

PLATINUM DISHES

Platinum Dishes in any form, round or flat bottoms, with or without lips for all purposes



DISH

FILTER CONES

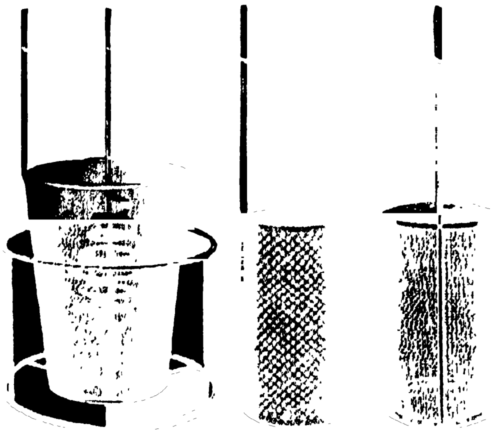
Seamless Platinum Filter Cones—perforated .020 inch. All sizes. Specially made cones perforated 0.16-.025 inch—to order.

CONES

WIRE GAUZE AND PERFORATED SHEET ELECTRODES

Carefully and accurately made electrodes of all standard shapes and sizes—either gauze or perforated sheet. Our Electrodes give the maximum of satisfactory service.

Made for any standard electrolytic apparatus. Also to specifications of standard authorities.



GAUZE AND SHEET ELECTRODES

CATALOG K-15—SENT ON REQUEST

AMERICAN PROCESS COMPANY

Drying, Pressing and Cooking Machinery

68 William Street, NEW YORK, N. Y.

PRODUCTS

Dryers, Presses, Digesters and Cookers

AMERICAN PROCESS MACHINERY

Distinguishing features of American Process Company's machinery are its automatic, continuous and uniform action.

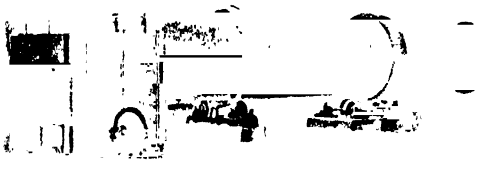
Advantages (1) Product is uniform; (2) labor is reduced to a minimum; (3) wear and tear of starting, stopping and reversing or otherwise changing the load are eliminated, thus prolonging life of machine far beyond that of similar types; (4) economy in fuel consumption, heat being applied direct; (5) saving in power and increase in capacity by continuous action.

Scope of Use The dryers manufactured by American Process Company will handle any kind of animal, vegetable and mineral materials, organic or inorganic matter, solid or liquid. They are operated either by direct heat or steam heated air.

Continuous screw presses, of different construction, for separating any solid matter from its liquid, can be adapted for slaughter house tankage (residuum of fats), as well as for pressing fish and reclaimed rubber.

Digesters and cookers to meet all conditions.

DRYERS



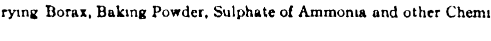
SAND, ORE AND FERTILIZER DRYER

Direct heat rotary dryer, with gear ring. Materials and gases travel in same direction. Erection of dryer with furnace can be performed by any competent mechanic. Wet material and furnace gases enter shell together at higher end. Wet material falls to bottom of shell, is caught by an interior shelf, elevated to almost highest point of rotation, and then falls again through furnace gases. This operation, with highest temperature in contact with wettest material, continues until dried material is discharged through lower end of dryer.

DRYER, CAPACITIES AND DIMENSIONS

No	Capacity (lbs.), sand, ore, etc., per hour, when 5% moisture	Capacity (lbs.), of fertilizer, etc., when 50% moisture	Horse power	Shipping weight, in lbs.	Floor space
C II	10,000	1,000	5-8	10,000	27′ 6″ x 6′ x 6′ 6″
C III	20,000	2,000	8-12	12,000	32′ 6″ x 6′ x 6′ 7″
C IV	30,000	3,000	10-15	15,000	37′ 6″ x 6′ x 6′ 7″
C V	40,000	5,000	15-20	28,000	42′ 6″ x 9′ x 8′ 9″
C VI	50,000	8,000	20-25	30,000	50′ 6″ x 9′ x 9′

We also manufacture counter current dryers and brick lined, roasters.



STEAM HEATED AIR DRYER

For drying Borax, Baking Powder, Sulphate of Ammonia and other Chemicals.

AUTOMATIC CONTINUOUS SCREW PRESS

This press is self-contained and of continuous screw type, consisting of a horizontal tapered screw, built up on a hollow perforated shaft and arranged to allow admission of steam, if desired. Screw fits closely inside of a similarly tapered slatted curb and rotates. Material, forced into conveyor portion of screw, then into curb, must move towards small end of press as screw turns. Size of discharge opening is regulated. Drainage is both internal and external. To regulate supply of material, a patent feeder is furnished.

CONTINUOUS SCREW PRESS

For pressing fish, slaughter house tankage (residuum of fats, etc.), reclaimed rubber, etc. Material fed in at one end and discharged at the other, liquids forced out between slats, into drainage holes of shaft, thence to a tank. Built in all sizes.

AUTOMATIC CONTINUOUS DIGESTER AND COOKER

Direct steam, self-contained type and operated continuously. A screw conveyor (inside a cylindrical shell) rotates, cuts up, digests and thoroughly agitates material and carries it forward. Steam admitted through perforations in hollow shaft of conveyor. Note forced rotary feed at admission end. Liquid and solid matter are discharged together, thence to a tank. Drainage tank can be built at small expense.

AUTOMATIC CONTINUOUS DIGESTER AND COOKER

Feed, digester proper and discharge all driven by sprockets and chain belting. Very little vibration, and digester can be erected in upper stories of building. Built in all sizes.

CO-OPERATIVE SERVICES

Complete drawings and directions are always furnished for the erection and operation of dryers and, generally, no outside assistance is required. Recommendations made and, if desired, an engineer will be placed in charge of the installation.

REFERENCES

Lists of satisfied users sent upon application.

AMERICAN PULVERIZER CO.

GENERAL OFFICES AND WORKS

18TH AND AUSTIN STREETS, ST. LOUIS, MO.

PRODUCTS

Manufacturers of the American Ring Pulverizer. (Patented.)

ADAPTABILITY OF OUR STANDARD MACHINES

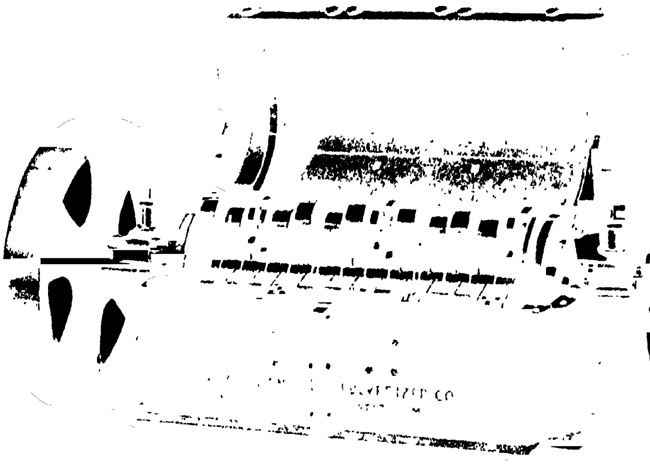
These machines will crush 10″ lumps to a powder; any desired material, such as Shale, Coal, Coke, Barytes, Phosphate Rock, Limestone, Asphalt, Quartz Rock, Bone, Clinkers, Sandstone, Carbon, Ore, Rock, Granite Rock, Slag and similar hard substances.

ROLLING RING ACTION OF THE AMERICAN PULVERIZER

In all centrifugal machines the rigidity of the running members, with the consequent friction losses, is the reason for high power consumption.

The American Pulverizers Ring System is flexible and therefore reduces the necessary motor power. The Rings with a 6″ inside diameter are suspended by 2″ shafts, therefore can be thrown back 4″ when larger pieces are blocking their passage and roll over foreign material without damage to the machine.

Its flexibility guarantees against any damage by foreign material.



NO. 37 AMERICAN RING PULVERIZER
Open for inspection. Equipped with rolling and shredder rings

600 REVOLUTIONS PER MINUTE

Its crushing and grinding is done by the Rolling Ring, not by a blow like a Swing Hammer. 60% of the weight of the Rings can be used before replacement is necessary.

Corresponding to the raw material our different type of rings can be applied in the same machine, making it a Pulverizer, Crusher, Shredder or Disintegrator.

MADE IN 8 SIZES

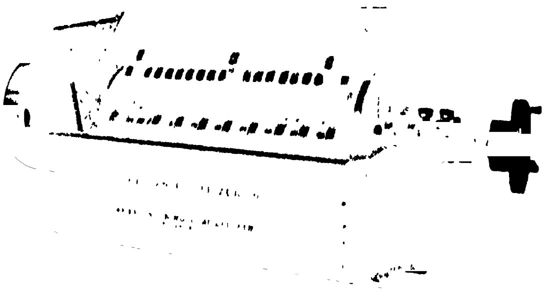
Cost of Power, Labor, Wear and Tear. Limestone dust, 10 to 15 cents per ton; coal crushing, 3 to 5 cents per ton. Further particulars on request.

COAL CRUSHERS

The ideal machine for coal and coke is the American Ring Crusher.

The product is a finished stoker coal without rescreening, with the least horse power and smallest amount of dust.

The machine will dispose of any foreign material contained in the coal automatically and crush all the pyrite without any trouble.

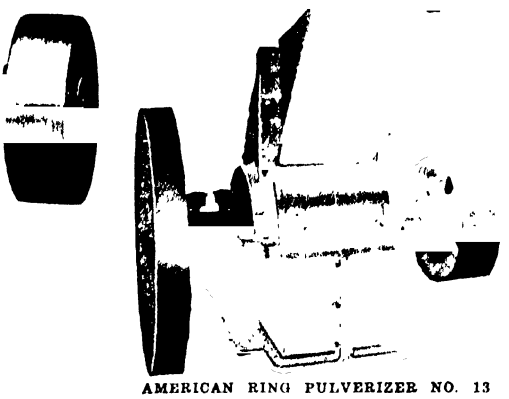


NO 60 COAL CRUSHER
With three lifted rings and side housing removed

CHEMICAL MACHINES

The low speed prevents heating of the material and allows to pulverize all chemicals with low melting points as Alum, Shellac, Dancing Floor Wax, Intermediates, Niter Cake, Nitrate of Soda, etc.

The machines will not clog and gum up. It will handle man-sized lumps and crush and grind the same in one operation to the required fineness.



AMERICAN RING PULVERIZER NO. 13
For chemical factories

NO EXTRA BREAK REQUIRED WITH THE AMERICAN RING PULVERIZER

The American Ring Pulverizer is a One Unit Machine. No rehandling is necessary and therefore it saves labor, Elevators, wear and tear and power.

It requires less working space and therewith reduces the cost of the building and foundation necessary.

AMERICAN STAVE & COOPERAGE CO.

Incorporated

57 Pearl Street

CHELSEA, MASS.

PRODUCTS

Wooden Tanks for

- Agitating
- Generating
- Mixing
- Separating
- Settling
- Straining
- Storing
- Tumbling

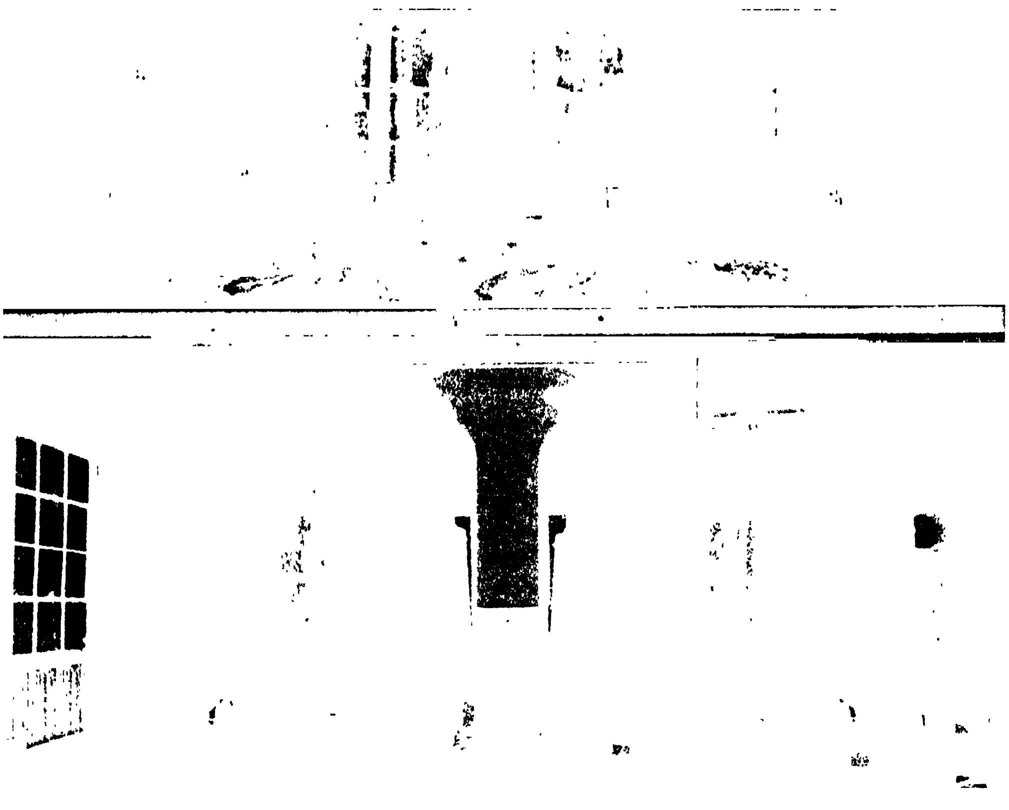
Kegs and Barrels for

- Liquids
- Semi-liquids

TANK INSTALLATION

The illustration below is of tanks, designed and erected by us in the modern extract plant of The Joseph Burnett Co. The liquid is first percolated in specially designed hogsheads, eight of which feed one of the small tanks shown on the upper floor. After going through the process there it is transferred by gravity to the large storage tanks below, one of which receives the contents of four of the small tanks There are thirty-two of the smaller tanks, which are made from prime white oak to hold the alcoholic contents

The eight large tanks were made by us about eignteen years ago for Sherry storage, and were subsequently bought by The Burnett Co It was necessary to rebuild these tanks and now they are as good as new, the stock being perfectly sound.



TYPICAL TANK INSTALLATION MADE BY US

AMERICAN STEAM GAUGE & VALVE MFG. CO.

Established 1851

MAIN OFFICE AND WORKS: BOSTON, MASS.

BRANCH OFFICES NEW YORK CHICAGO PITTSBURGH ATLANTA LOS ANGELES

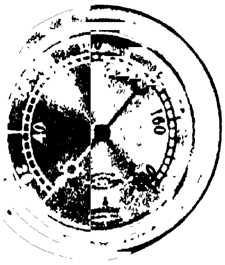
PRODUCTS

Gauges—Both Indicating and Recording for Steam, Water, Air, Oil, Gas, Hydraulic, Ammonia and all other pressures; also Vacuum and Compound.

Gauge Testers, Engine Room Clocks, Revolution Counters.

Pop Safety and Relief Valves, Steam Whistles, Engine Indicators, Feed Water Grease Extractors, Steam Traps.

AMERICAN GAUGES



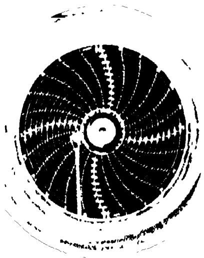
All parts subject to wear are of rugged construction and made of specially hard, wear-defying metal. The segment and pinion have unusually wide face to reduce wear.

Each dial is **individually hand** calibrated, insuring absolute accuracy.

Catalog No. 70 sent on request.

AMERICAN RECORDING GAUGES

Have the very highest grade dust-proof clock movement made, insuring accurate records.



The fountain pen used will not leak and holds sufficient ink to last one month

Throughout, the materials used have been selected with the idea of giving long wear.

The standard chart is 8″, for a 24-hour record, but special charts can be furnished

Catalog No. 70 sent on request.

AMERICAN POP SAFETY VALVE

The American is very simple in construction and has fewer working parts than other valves

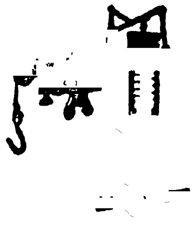
All adjustments can be made from the outside without taking valve apart. Bushings never leak.

Every valve is guaranteed to open promptly at the pressure stamped thereon and to close just as promptly with a minimum loss of steam.

Before leaving our factory, every valve is tested under actual working steam pressure.

Catalog No. 70 sent on request.

AMERICAN-THOMPSON IMPROVED INDICATOR



This is the original Thompson Indicator and has features found in no other make. The detent motion makes it possible to take as many cards as desired without unhooking cord, and the cord will remain at same tension.

Cards can be made in less time than is possible without the exclusive American detent motion. In addition, these cards are by far the most accurate due to the short arm and limited movement of pencil

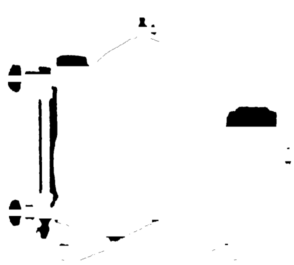
Exposed spring is free from temperature changes and can be changed with utmost facility.

This is the most perfect, most facile and most durable of all Indicators.

Send for American-Thompson Indicator Catalog.

AMERICAN IDEAL STEAM TRAP

This trap is built on extremely rugged lines and is guaranteed for all pressures.



Has a valve discharge orifice much larger than in ordinary traps, which means larger capacity. Consequently a smaller trap can be used. It also enables dirt and scale to pass off and prevents clogging Valve seat can be renewed without making disconnections.

A heavy Hercules float is used, made of seamless, non-corroding copper. It will resist pressures up to 600 lbs to the square inch and is guaranteed for the life of trap.

Valve seats are under a continuous water seal, thus cannot leak live steam.

Send for booklet, "A Steam Trap Catechism"

AMERICAN H.O GREASE EXTRACTING FEED-WATER FILTER

This device makes it impossible for oil to get into the boiler, thus preventing dangerous bagging plates and oil caked tubes. Keeps heating surfaces clean, increases steaming capacity and lowers coal bills.

Filtering surface is equal to many times the area of feed-water pipes. Has device for applying a reverse steam current for temporary cleaning.

Renewals are easy to make. Every part is easy to clean. Maintenance cost is practically nothing.

AMERICAN STANDARD WATER RELIEF VALVE

Constructed with iron body and bronze mounting, with our high-grade steel springs and are intended for use on pumps, tanks, pipe lines, etc., where requirements are not as severe as in fire protection service and for which service we recommend our Underwriter type valve.

These valves, however, have unusually large relieving capacity; and if desired both connections can be furnished threaded or flanged at slight additional cost. Regularly furnished set at any desired pressure not exceeding 250 pounds.

Send for Catalog No. 70.

AMERICAN STAVE & COOPERAGE CO.

Incorporated

57 Pearl Street

CHELSEA, MASS.

PRODUCTS

Wooden Tanks for

- Agitating
- Generating
- Mixing
- Separating
- Settling
- Straining
- Storing
- Tumbling

Kegs and Barrels for

- Liquids
- Semi-liquids

TANK INSTALLATION

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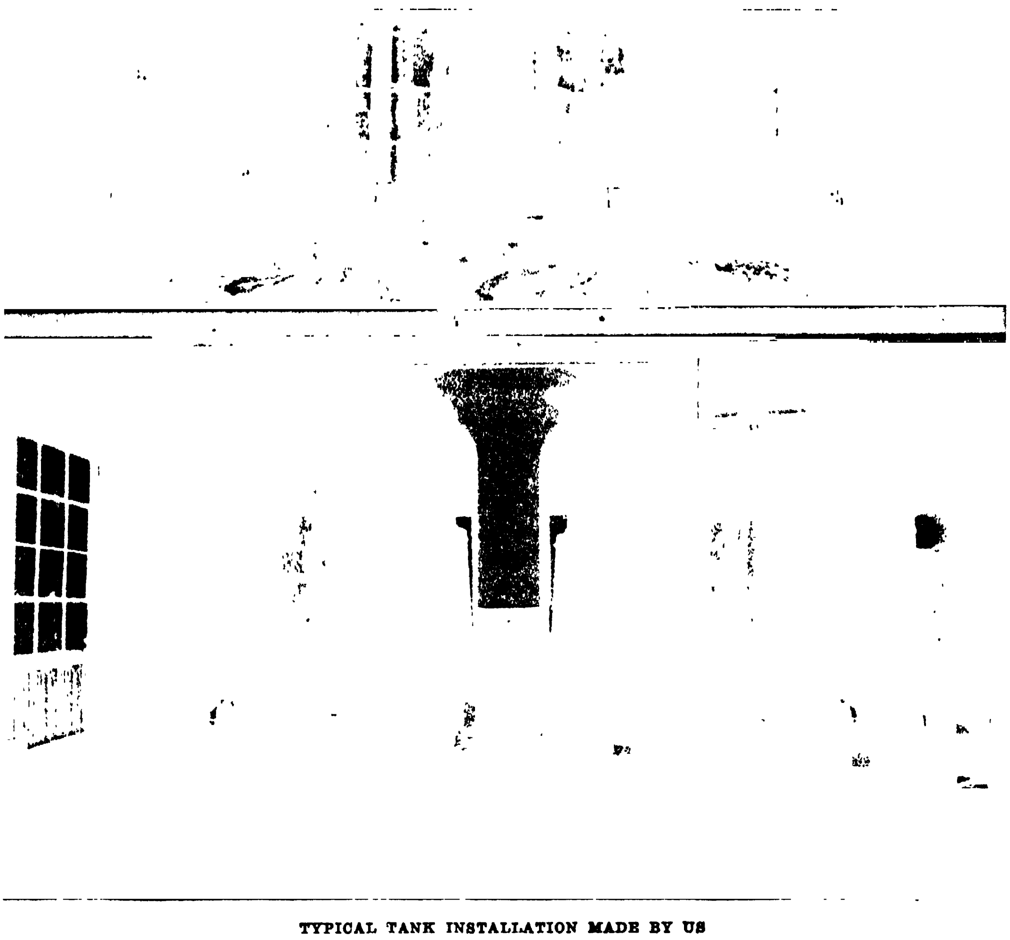


TYPICAL TANK INSTALLATION MADE BY US

AMERICAN TRANSFORMER COMPANY

178 Emmet St.
NEWARK, N. J.

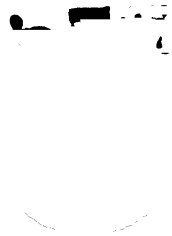
PRODUCTS

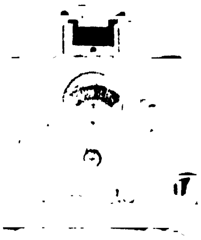
Transformers for Cottrell Electrical Precipitation Systems, Electric Furnace Work, Electrochemical Processes and Laboratory Work, High and Low Voltage Testing, Electric Welding, High Frequency Testing, Ozone Generation, Auto Transformers as Regulators, Radio Operation and Experimentation, Lighting and Power, and Reactances.

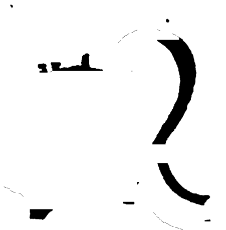
Open Iron Core Air Cooled Reactance Coil

Air Cooled Furnace Transformer

Portable Oil Testing Outfit Type TS 6


Water Cooled Furnace Transformer


30,000 Volt Testing Set with Regulator and Instruments

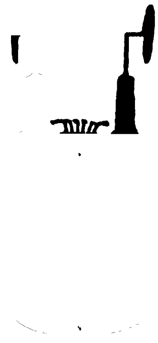

Laboratory Furnace Transformer

CUSTOM MADE

We specialize in the design and construction of made-to-order transformers, and our experience and manufacturing facilities equip us to fill every requirement in this line.

Engineers connected with the Electrochemical and Metallurgical industries have their own ideas as to the proper applications of alternating current for their purposes. The use of transformers is obviously the most effective method to achieve the best results.

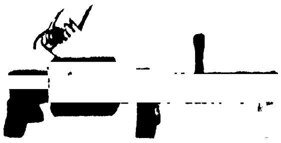
American Transformers are the result of special study of requirements of industrial applications. Their efficiency, operating economy and long life have made them preeminent in their field, a fact attested to by their hundreds of satisfactory installations.


100,000 Volt Transformer for Cottrell System of Precipitation

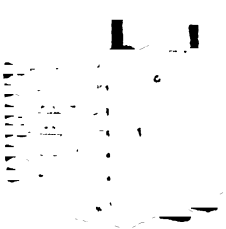
COOPERATION

Should you need a transformer for special purposes and conditions, beyond the usual commercial types, we will be glad to cooperate with you and help you solve your problems. When writing for estimates, send us complete data covering your requirements.

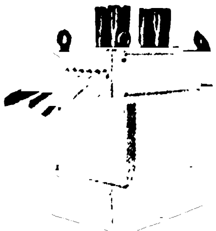
Heavy Current Oil Cooled Transformer


Open Iron Core Variable Reactance Coil

High Frequency, High Voltage Testing Set, 200,000 Volts, 200,000 Cycles


Portable ½ KVA Laboratory Transformer 1 to 64 Volts in 1 Volt Steps

50,000 Volt Testing Set


150 KVA Heavy Current Air Cooled Transformer

THE ABOVE ILLUSTRATIONS SERVE TO SUGGEST THE GREAT VARIETY OF EQUIPMENT WE ARE PREPARED TO BUILD FOR SPECIFIC CHEMICAL ENGINEERING REQUIREMENTS

AMERICAN TOOL & MACHINE COMPANY

Trade Mark Registered U. S. Patent Office

Established 1843

Engineers, Founders, Machinists

BOSTON, 9, MASSACHUSETTS

PRODUCTS

Weston Centrifugals, 5-inch, Hand Power, and 10-inch, Laboratory, 30-36-40-inch for Sugar, Salt, Chemicals and Drugs with adaptations for every manufacture requiring such process.

Elevators and Carriers for Sugar and Chemicals.

Mixers.

Hydro-Extractors.

Centrifugal Dryers for drying small pieces that have been coated, dipped, japanned, painted, plated, or washed.

Centrifugal Oil-Separators for saving oil from chips and turnings.

Fox Brass Finishers' Lathes.

Belt Knife Leather Splitting Machines.

Fabric Coating Machinery; Spreaders, Doublers.

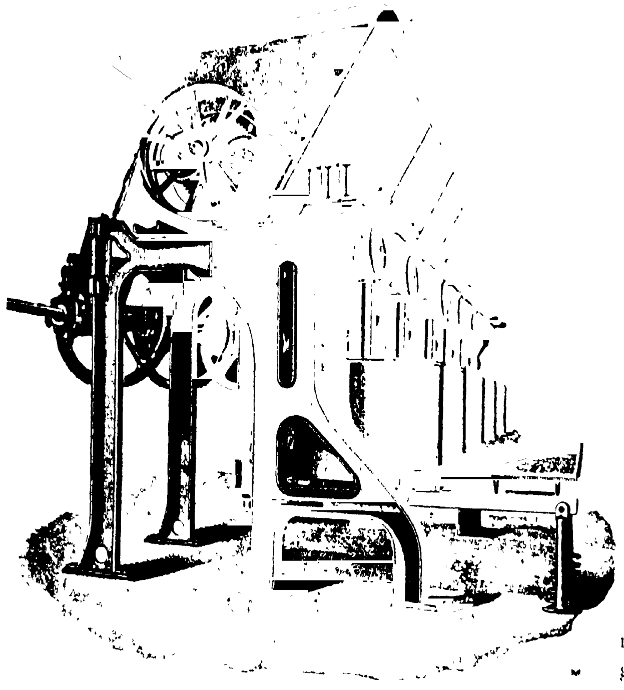
Rubber Cement Churns or Mixers.

Power Transmission Machinery.

Special Catalog of any machine sent on request.

WESTON CENTRIFUGALS

In 1866 David M. Weston brought his plans for Centrifugal machines to the American Tool & Machine Co and became intimately associated with them as the constructive developers of a marvelously serviceable machine.



WESTON CENTRIFUGALS IN BATTERY

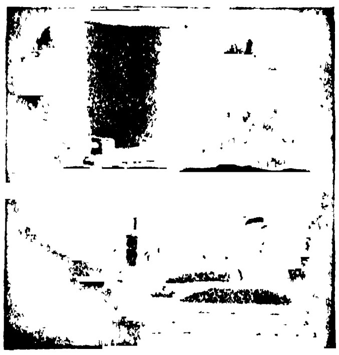
The first power centrifugal was made from designs by David M Weston in 1851

The Weston Sugar centrifugal was first manufactured, and as operated to-day in the 40-inch size, is a machine of vast capacity, delivering a perfect product at a minimum expense It is driven from the top by water, belting or direct connected motor controlled for all speeds by a single lever and is made in three sizes—30-36-40 inches diameter. The engineering department with the records of more than a half century of success has been of untold service to the sugar manufacturer

After the sugar centrifugal came the Hydro-Extractor, the Oil-Separator and the 10-inch Laboratory Centrifugal, then the 5-inch Hand Centrifugal. During this period special adaptations of both the top and bottom drive were made without any alteration of the original principles patented by Mr. Weston which are still maintained as standards

The development of the chemical industry from the first processes on raw material to the finished dyes, pigments, drugs, juices, sugar, nitrates and a multitude of allied products is dependent on the centrifugal. The mechanical principles of the Weston Centrifugal have stood the test through all these years as most simple, reliable and economical in operation and repairs.

HYDRO-EXTRACTORS



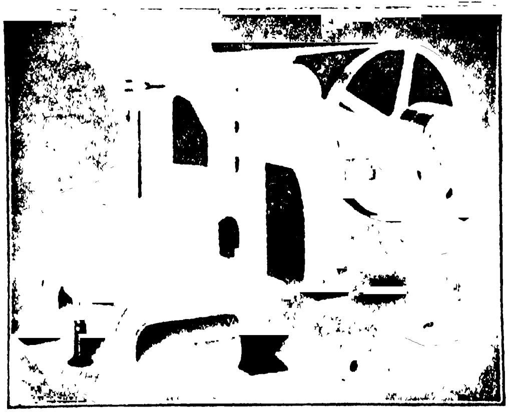
WESTON HYDRO-EXTRACTOR

Hydro-Extractors, under-driven for every requirement in the manufacture of fibers and woven or knitted goods or garments.

No obstruction in Basket.

Sizes from 20 inches to 54 inches diameter.

Continued on Next Page



10-INCH LABORATORY CENTRIFUGAL, BELT OR MOTOR DRIVEN INDISPENSABLE IN THE LABORATORY

ROPER CENTRIFUGAL OIL SEPARATOR

For removing oil from chips and turnings The oil is just as good to use again and the chips can be easily handled

NO. 2

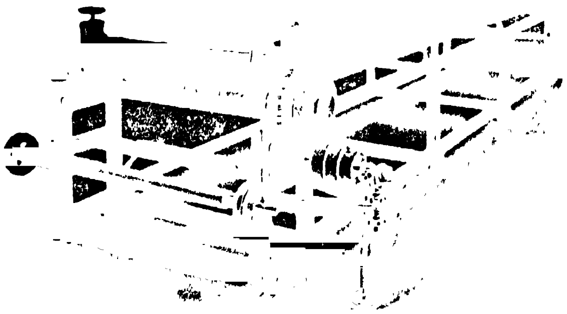
Made in two sizes

No. 1, 525 cubic inches capacity.

No 2, 2,540 cubic inches capacity.

FABRIC COATING MACHINES

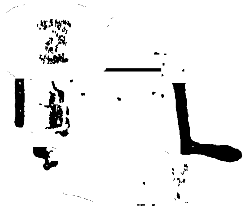
For coating, waterproofing or doubling all textile fabrics.



SPREADER, SINGLE END

HAND POWER CENTRIFUGALS

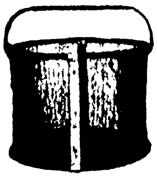
5-inch Hand-power Centrifugal for Samples and Quick Tests



HAND POWER CENTRIFUGAL

CENTRIFUGAL DRYERS

Centrifugal Dryers, with removable basket for drying small pieces that have been coated, dipped, japanned, painted, plated or washed

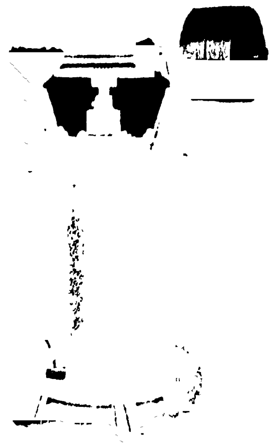


REMOVABLE BASKET

CENTRIFUGAL DRYER

RUBBER CEMENT CHURNS OR MIXERS

A simple, popular machine of great utility for mixing cements or coatings for fabrics



RUBBER CEMENT CHURN

Two sizes, 75 gallon and 200 gallon.

AMERICAN WATER SOFTENER COMPANY

Specialists in all Branches of Water Purification

PHILADELPHIA, PA.

PRODUCTS

Water Filters, pressure and gravity types
Water Softeners, Lime-Soda and Decalso of Pressure and Gravity Types.
Water Sterilizing Apparatus.
Mechanical Filter Equipment:
- **Chemical feed devices**
- **Water and air manifolds**
- **Strainers and sand valves**
- **Filter sand and gravel**
- **Controllers**
- **Gauges**
- **Operating tables**
- **Wash troughs**
- **Water stills**

ENGINEERING SERVICE

The American Water Softener Company is prepared to make scientific investigations of water supplies and to make recommendations for the solution of water purification problems. The company will contract to design and build complete filtration or water softening plants supplying the whole or any portion of the special mechanical equipment

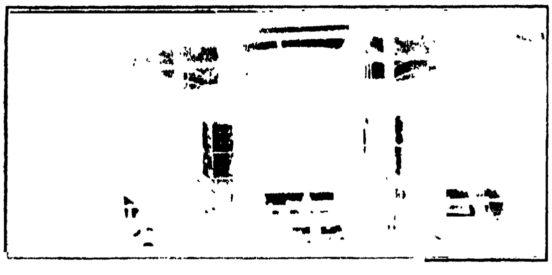
SCOPE OF USE

Water filters are used for the elimination of dirt, color, odors, bacteria, iron and general waste matters Softeners are for removal or reduction of hardness, also for neutralizing acid waters and for purifying the water used in sugar refining and many other industrial processes of manufacture

DECALSO (Sodium Zeolite) WATER SOFTENER

Operating Principle This system operates through a base exchanging process by which the "hardness causing" salts of lime and magnesia are absorbed and are replaced by sodium from the Decalso. When the available sodium is given up Decalso is exhausted and is regenerated or recharged with sodium by washing with a solution of common salt (sodium chloride).

Decalso is a material that is placed in a container or tank and through which the hard water is passed, in the quantity and for the period of time for which the particular plant is designed, until exhaustion Regeneration is accomplished by breaking up the Decalso bed by means of reversal of current of water or with air or by both in combination, followed by treating with a salt solution and final rinsing with water to remove any excess salt.



"DECALSO" WATER SOFTENING PLANT
Weidmann Silk Dyeing Co., Paterson, N. J.

In the Decalso process there is no manipulation or adjustment of chemical valves, no sludge or precipitate and no other chemicals to handle than salt. Decalso automatically and naturally compensates for variations in the hardness of the raw water.

Special Application—Decalso softeners are particularly suited to manufacturing processes producing materials that precipitate calcium and magnesium; in plants for dyeing, bleaching and finishing of silk, wool and cotton, laundries; tanneries; soap works or wherever soap or saponifying oils are used.

LIME-SODA WATER SOFTENERS

Continuous Type This type of water softener consists of a settling tank of sufficient size to allow the water a given period of sedimentation between the period of receiving the softening solution and the time of leaving the overflow pipe, an accurate mechanical device, operated automatically by the flow of water, for proportioning a definite amount of softening solution to a given amount of water, a sludge removal system in bottom of settling tank by means of which the sludge or accumulated precipitated impurities are periodically blown out, a filter bed of wood-wool or of sand for removal of any fine precipitate that may fail to settle in the sedimentation process, and such small tanks as are required for the preparation and storage of the softening solution, together with suitable motor for agitating the solution and maintaining a supply, by pumping, at the point where it is proportionally fed to the water.

Special Application—For the removal of scale forming mineral matter from boiler feed waters and for softening very hard waters where three to five grains of hardness, per gallon, may be permissible and in combination with Decalso softeners on waters that are too hard to be commercially practicable with the Decalso process alone.

Vertical Horizontal
PRESSURE FILTERS

Agitator Type
GRAVITY FILTER

PRESSURE WATER FILTERS

Made either vertical or horizontal in form, contain properly graded sand and gravel that may be thoroughly washed and cleansed by reverse current of water, with or without air agitation. In this type of filter the water may be pumped directly through into piping system or supplied by tanks, reservoir or stand-pipe.

GRAVITY WATER FILTERS

Usually round or rectangular and are similar in operation to the pressure type of filter. The washing and cleansing of the sand bed is accomplished by a reverse current of water which is sometimes supplemented with air or mechanical agitation to conserve the use of wash water in breaking up the sand.

MATERIALS OF CONSTRUCTION

Steel or cast iron is used for the pressure type of Decalso Softeners and Water Filters. Wood, concrete or steel construction, according to existing conditions or purchaser's preference, may be used for the Gravity Filters, and for Gravity Decalso or Lime-Soda Softeners.

AMERICAN WELDING COMPANY

ROWLAND FORGE WELDED

GENERAL OFFICES AND WORKS: CARBONDALE, PA.

PRODUCTS

Autoclaves, forge-welded, all sizes and pressures.

One-ton forge-welded containers for shipment of compressed gases.

Forge-welded storage tanks for compressed gases.

Forge-welded digesters for wood-pulp industry.

Forge-welded petroleum stills for cracking processes.

Forge-welded kettles, jacketed or unjacketed, for fusion, reduction, sulphonating, nitrating, evaporating.

Caustic pots, crystallizers and evaporators.

Forge-welded rotary carbonators and drum dryers.

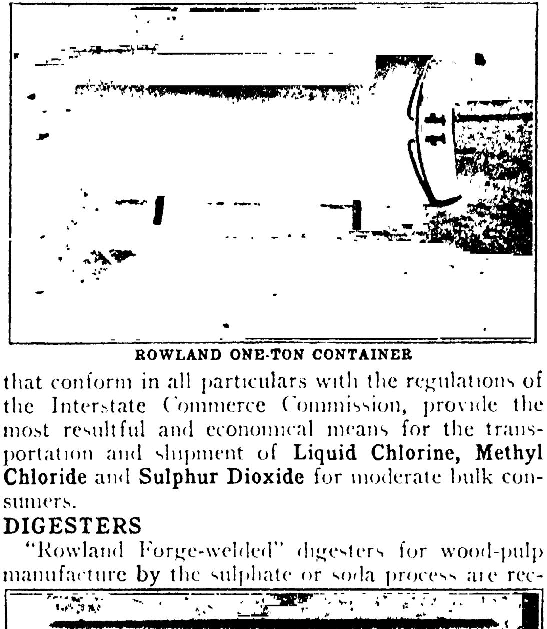
All products of the American Welding Company are forge-lap-welded, presenting a smooth surface on both sides.

AUTOCLAVES

"Rowland Forge-welded" autoclaves made of fire-box steel plates having ultimate tensile strength not less than 55,000 pounds per square inch combine the maximum of strength with light weight. Cast construction can only assure an adequate degree of safety at the expense of thick walls that seriously impair the heat transmission. Forge-lap-welded autoclaves are superior.

ROWLAND ONE-TON CONTAINERS

"Rowland Forge-welded" One-ton containers of rolled mill plates and produced under specifications that conform in all particulars with the regulations of the Interstate Commerce Commission, provide the most resultful and economical means for the transportation and shipment of **Liquid Chlorine, Methyl Chloride** and **Sulphur Dioxide** for moderate bulk consumers.



ROWLAND ONE-TON CONTAINER

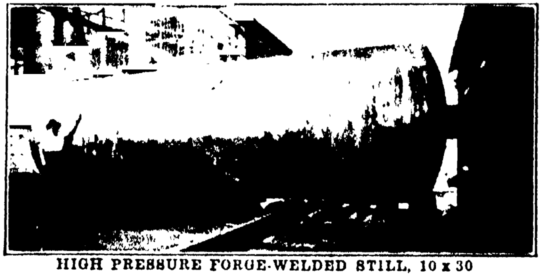
DIGESTERS

"Rowland Forge-welded" digesters for wood-pulp manufacture by the sulphate or soda process are recognized by the industry as superior in both design and construction. With all seams forge-lap-welded by the water gas process these digesters exhibit a smooth interior surface without seam or rivet and possess a longer life and greater freedom from leaks than riveted construction. Flanged connections for steam and liquid and manholes are welded in place. Sizes limited only by railroad transportation facilities.

FORGE-WELDED DIGESTER

PETROLEUM STILLS

"Rowland Forge-welded" petroleum stills for high pressure work and cracking processes increase output through fewer shut-downs and reduce operating and maintenance costs to a minimum by designs and manufacturing methods that are distinctly correct.



HIGH PRESSURE FORGE-WELDED STILL, 10 x 30

KETTLES

Kettles of rolled steel plate fabricated by **"Rowland"** methods are being widely used for a variety of services for fusion, reduction, sulphonating, nitrating, crystallizing and evaporating. All of this product is built entirely from customers' specifications and drawings. **Every customer is scrupulously protected as to his exclusive ideas or designs.**

ADVANTAGES

The "don't" in building forge-welded product is as important as the "do" because many welds look alike on the surface. Real values are necessarily concealed until time and use will reveal them.

The most valuable evidence therefore in choice of forge-welded equipment is the opinion formed of such by observing owners. When a reputable manufacturer desires and possesses the esteem of owners, superintendents and foremen, you accept such evidence unquestionably as an infallible guide. Through such performances our 28 years of production of super-forge-welded product has made old friends of new friends.

PLANT OF AMERICAN WELDING COMPANY, VIEW FROM WEST

SERVICE

Back of every good product are manufacturing methods that keep it good and insure a healthy growth of the business. You eliminate all guesswork when dealing with a manufacturer that has devoted over a quarter of a century to building a reputation for efficiency and establishing a superior character of service.

THE AMERICAN WELL WORKS

Manufacturers of Centrifugal and Deep Well Plunger Pumps

AURORA, ILLINOIS

FIRST NATIONAL BANK BUILDING, CHICAGO, ILLINOIS

DISTRICT AND SALES AGENCIES

New York N Y
(Domestic and Export)
Philadelphia, Pa
Pittsburgh, Pa
St Paul, Minn
San Francisco, Calif
Los Angeles, Calif
Artesia N M
Salt Lake City, Utah
Denver, Colo
Kansas City, Mo
Joplin, Mo
St Louis, Mo
Birmingham, Ala
Dallas Tex
Montreal, Que., Can.
Chatham, Ont., Can
Calgary, Alta., Can
Edmonton, Alta., Can

PRODUCTS

Centrifugal Pumps of every description from a small pump with 3/4 in. openings and a capacity of 10 gals. per minute to a 60-in. pump with a capacity of 100,000 gals. per minute, for chemical plants, water works, irrigation, drainage, mine, fire protection, quarry, dredge, hydraulic giant, caisson, foundation, sump, trench, bilge, boiler feed, condensing, street flushing and general purpose pumping.

Deep Well Turbine Centrifugal Pumps for pumping wells 12 ins. and larger in diameter and to 250 ft. in depth.

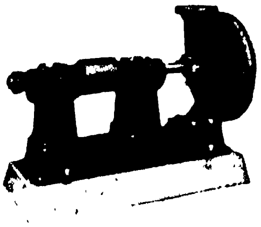
Deep Well Plunger Pumps, Single Acting, Double Acting and 2-stroke.

"AMERICAN" CENTRIFUGAL PUMPS

These pumps are built in a large number of standard types, and in addition special pumps are designed and built to meet particular conditions especially in chemical plant service.

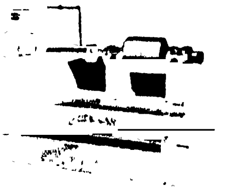
Centrifugal pumps are made with either open type or enclosed type impellers, with or without diffusers and with either suction or double suction in single stage pumps. All double suction pumps and some single suction pumps are made with split casing, so designed that the cap, or cover, of the casing can be removed to expose internal working parts without disturbing pipe connections.

Characteristics — The important features of "American" centrifugals are skilful designing so that they attain high efficiencies with flat efficiency curves, thus being economical in use through a wide range of delivery; use of good material in their construction, careful machining and accurate adjustments.



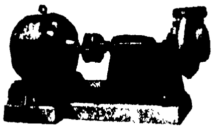
TYPE ABE ACID PUMP

Made in small sizes with lead lining and antimony lead composition impeller for pumping certain kinds of acids and chemicals. Chemical pumps are also made of all bronze and special metal composition to meet special requirements



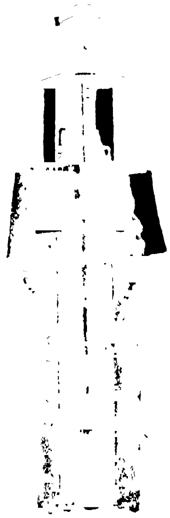
TYPE L

High pressure single stage, horizontal, belt driven centrifugal pump, of extra heavy construction, for total heads up to 125 feet



TYPE PMD

High pressure, single stage, horizontal centrifugal, with grit proof bearing. Motor driven, for total heads to 200 ft



HIGH PRESSURE, 2-STAGE TURBINE CENTRIFUGAL PUMP, WITH MOTOR DRIVE

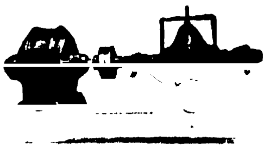
Bearings are ring oiled from oil reservoirs. Impellers are given both rotative and end thrust balance. In single suction, open impeller type pumps, the sides and edges of impeller and interior of casing are carefully machined and closely adjusted at sides to prevent leakage.

Double suction types are fitted with labyrinth rings around suction openings to reduce leakage to a minimum. Multi-stage, enclosed impeller types are designed to have fewest points of leakage back to suction openings.

Drive — "American" centrifugal pumps are equipped with plain pulley for belt drive, with grooved sheave for rope drive, steam engine, gasoline engine, electric motor, steam turbine, or with hydraulic turbine.

Pumps are also supplied unmounted with flexible shaft coupling for any power, or mounted on base, but without attached power.

Catalogs—Catalogs describing "American" Pumps will be sent on request. No. 149 describes centrifugals; No. 130A, Deep Well Plunger Pumps.



TYPE DSMD

High pressure, double suction, single stage, split volute, for total heads to 125 ft

TYPE H

High pressure, 2 stage, vertical shaft, for total heads to 150 ft.

TYPE IMD

High pressure, 2 stage, motor driven, for total heads to 250 ft

FIG. 110E

Power head for deep well plunger pump.

THE ANDREWS LEAD COMPANY

Incorporated

Manufacturers of

The Full Line of Blue Lead Products

OFFICE AND FACTORY

LONG ISLAND CITY, N. Y.

PRODUCTS

- Chemical Sheet Lead
- Antimonial Sheet Lead
- Chemical Lead Pipe
- Antimonial Lead Pipe
- Lead Burning Bars
- Lead Wire
- Lead Traps and Bend
- Lead Tubing
- Ribbon Lead
- Lead Wool
- Block Tin Pipe
- Tin Lined Lead Pipe

All products offered for sale by us are manufactured in our own plants.

ROLLING EQUIPMENT

Our mills are driven by reversing electric motors with full magnetic control and sheet lead produced by us is free from ripples and scale, and is of uniform thickness throughout.

We produce sheets in all widths to nine feet and of any desired thickness or length.

HYDRAULIC EQUIPMENT

We have the most modern hydraulic presses of various capacities to one thousand tons, with complete stock of dies for special shapes and for lead pipe in all diameters to twelve inches, of any required thickness of wall

FACILITIES

We are in position to supply firms making installations of lead equipment, the highest grade chemical sheet lead and other lead products, from a small order to the largest of acid plant requirements.

Deliveries can be had from us promptly.

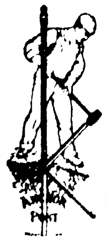
GUARANTEE

All "Andrews Lead" Products are guaranteed to be made of new metals of the best grades.

INQUIRIES

Address all inquiries to

The Andrews Lead Company,
26-36 Greenpoint Ave.,
Long Island City, N. Y.



ANCHOR POST IRON WORKS

Manufacturers of Wire Fences, Iron Railings
and Entrance Gates

OFFICE AND SALESROOMS: 50 CHURCH ST., NEW YORK, N. Y.

Telephone CORTLANDT 4886 7 8 9

SALES AND ERECTION OFFICES

Boston Mass 79 Milk St
Hartford Conn 902 Main St
Richmond Va 119 Mutual Bldg
Philadelphia, Pa, Real Estate Tr Bldg
Mineola L I, Jericho Turnpike
Cleveland, Ohio, Guardian Bldg
Stamford Conn, 11 Clinton Ave
Rochester, N Y 1604 Main St, East
Chicago Ill, 8 So Dearborn St

FACTORIES GARWOOD, N J, AND CLEVELAND OHIO

PRODUCTS

Anchor Post Chain Link Woven Steel and Mesh Fences and Gates; Woven Wire Fences; Anchor Posts; Picket Railings; Electrically Welded Iron Railings and Gates, for factories, water companies and railroads; Wire Fences and Electrically Welded Sliding and Swinging Gates for country and suburban homes; Wrought Iron and Wire Window Guards; Intertrack Fences.

ENGINEERING AND ERECTING SERVICE

Anchor Post Iron Works has been called upon, by many industrial corporations and railroads, to design fences to meet a wide variety of conditions The experience thus acquired is offered for the solution of problems

At New York, and also at the several branches, is maintained a force of men skilled in putting up our fences and in solving construction problems When a customer prefers to erect a fence, instructions and necessary tools are furnished

INFORMATION REQUIRED FOR ESTIMATES

In writing for prices or ordering, draw a simple diagram showing length of fence lines, location of gates, corners and ends, width of gate openings, single and double. State whether ground is level or graded

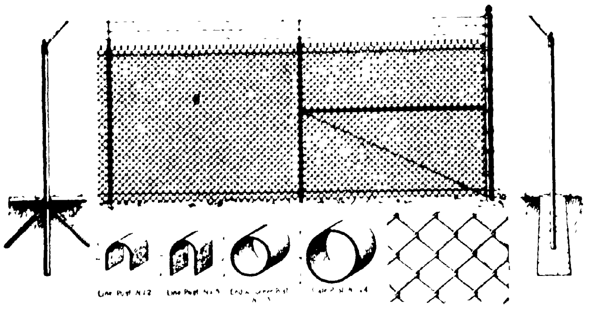
ANCHOR POSTS

Anchor posts are U-bars of high carbon steel and, together with all other parts, are heavily galvanized above and below ground, preventing rust and insuring long service Posts are driven into the ground and held rigidly erect by two anchor stakes driven through slots clamped to opposite sides of the posts

CHAIN LINK WOVEN STEEL FENCES

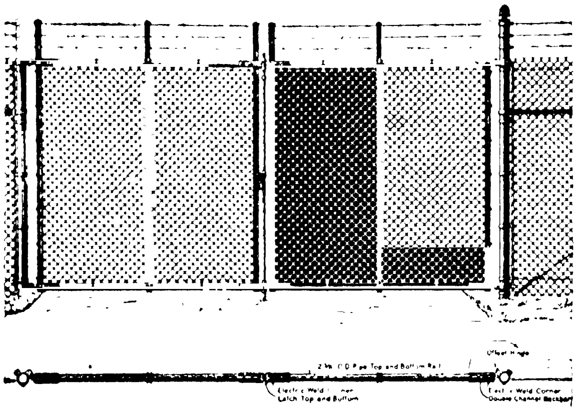
Chain link woven steel is of the best quality galvanized steel wire of No 9 or No. 6 gage, No 6 being the size most used Made in any width up to 10 ft The mesh is so small it affords no foothold for fence climbers, and as an additional protection three or more strands of barbed wire are fastened to inwardly inclined arms attached to the tops of posts.

Fence is furnished with or without top rail of galvanized pipe Posts and all fence parts are galvanized by hot dip spelter process. Under conditions where protection is of utmost importance, these fences are made 10 ft in height, and diagonal arms and barbed wire are attached to both front and back of posts, the spread across the top is about 2 ft. The gates are as unclimbable as the fence.



CHAIN LINK WOVEN STEEL FENCE, TYPE DOA 1

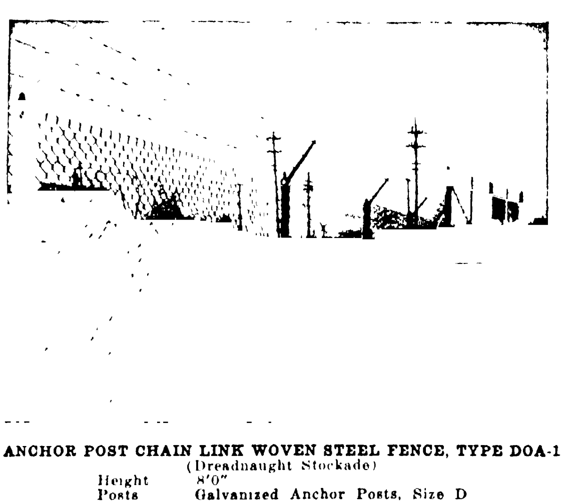
Fabric Chain link woven steel—wire No 6 gage
Line posts Galvanized Anchor posts, size No 3, 2½ in steel U bar, set 8 ft on centers
End and corner posts 3 in steel pipe Gate posts, 4 in steel pipe



Offset Hinge
2½ in O D Pipe Top and Bottom Rail
Electric Weld ... Latch Top and Bottom
Electric Weld Corner Double Channel Backbar

ELECTRICALLY WELDED SWINGING GATE, TYPE G

Frames made with electrically welded uprights and corner pieces Standard gates made in height to match fence Single gates, 4 to 10 ft between gate posts, double gates, 8 to 24 ft and larger



ANCHOR POST CHAIN LINK WOVEN STEEL FENCE, TYPE DOA-1
(Dreadnaught Stockade)

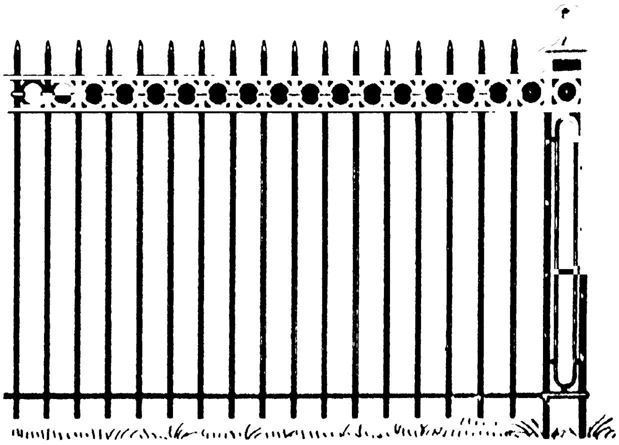
Height	8'0"
Posts	Galvanized Anchor Posts, Size D
Fabric	Chain Link 2" mesh No. 6 wire

Continued on Next Page

ELECTRICALLY WELDED RAILINGS AND GATES: "ANCHOR-WELD"

A new and quite revolutionary process in the manufacture of railings and gates has recently been perfected.

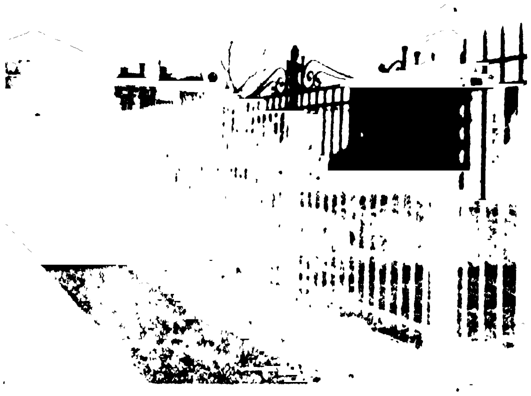
Anchor Post Iron Works has secured the rights of manufacture, and has installed the necessary electrical machinery for the manufacture of railings and gates of every size and weight, from those made of light iron bars of ½-in square or round, up to the very heaviest forms required for any service. By this process, the rails pickets or other members are welded together at all points of intersection under a heavy electrical current, combined with a mechanical pressure of from 1 to 5 tons exerted at the moment the weld is made. This insures an absolute and unbreakable union of the metal of both the pickets and the rails.



ANCHOR WELD RAILING

Railings and gates made in this way are remarkably strong and rigid. Each unit, that is, each panel of railing, or each gate, being welded into practically one piece of metal, is free from weak joints or rivets.

Catalog 56 describes this type of railing. A copy will be sent on request.

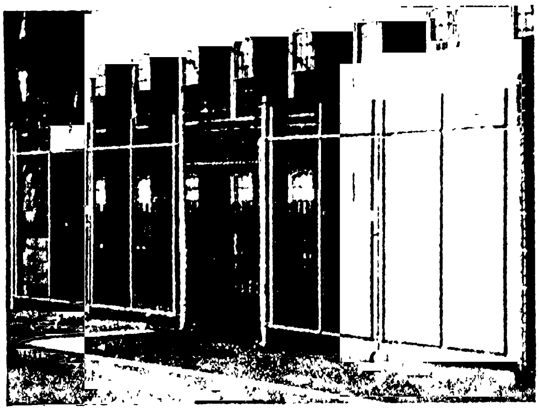


ANCHOR-WELD RAILING, TYPE RB3

Including Double Entrance Gates made and erected by us. The railing is 6 ft. in height. ¾ inch grooved square pickets and rails, set on Galvanized Anchor Posts. The Gate, Type GB3 1, is 12 ft. wide, hung from Gate Posts. Design No. 200 4 inches square.

ANCHOR WELD RAILING, TYPE RA 3 ELECTRIC WELD GATE 20 FT WIDE

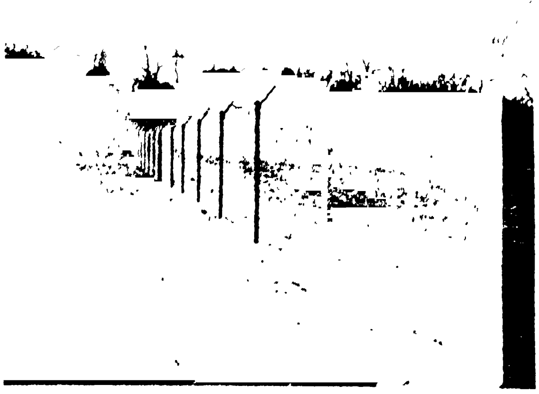
Twenty four hundred feet of this railing and 8 single and double entrance gates were furnished and erected by us for the Willys Corporation Elizabeth N. J. The railing is 6 ft. in height.



DOUBLE CHAIN LINK GATES, TYPE G

Width of opening 14'0"—Height 8'0"

Standard gates are made in height to match fence with the following widths, measuring between gate posts. Single gates, 4 ft. 6 in., 5 ft., 6 ft., 7 ft., 8 ft., 9 ft., and 10 ft. Double gates, 8 ft., 9 ft., 10 ft., 12 ft., 14 ft., 16 ft., 18 ft., 20 ft., 22 ft., 24 ft. and larger to measure.



SQUARE MESH FENCE, TYPE COA-5

Height 7'0"
Posts Galvanized Anchor Posts Size C.
Fabric No. 9 Galvanized wire, woven into rectangular mesh
Equipped with arms and 3 strands of barbed wire

THE V. D. ANDERSON COMPANY

Oil Mill Machinery and Steam Specialties

CLEVELAND, OHIO

PRODUCTS

- **Oil Expellers**
- **Moisture Expellers**
- **Crackling Expellers**
- **Steam Traps**
- **Air Traps**
- **Steam Separators**
- **Oil Separators**
- **Pressure Oil Filters**
- **Dryers**

ANDERSON OIL EXPELLERS

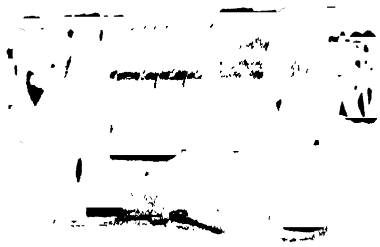
Operation The Anderson Oil Expeller is a continuous press, the material being fed into a perforated hardened steel cylinder, in which revolves a shaft carrying a series of hardened steel screws, so arranged as to produce a gradually increasing pressure

Either a hot or cold pressing of all oil-bearing seeds can be made with the Expeller, and more oil can be obtained than is possible with any other type of press

Advantages Press cloths are not required in an Expeller mill

Once the machinery is started, one man can run a plant of six Expellers

The Expeller may be either belt or motor driven



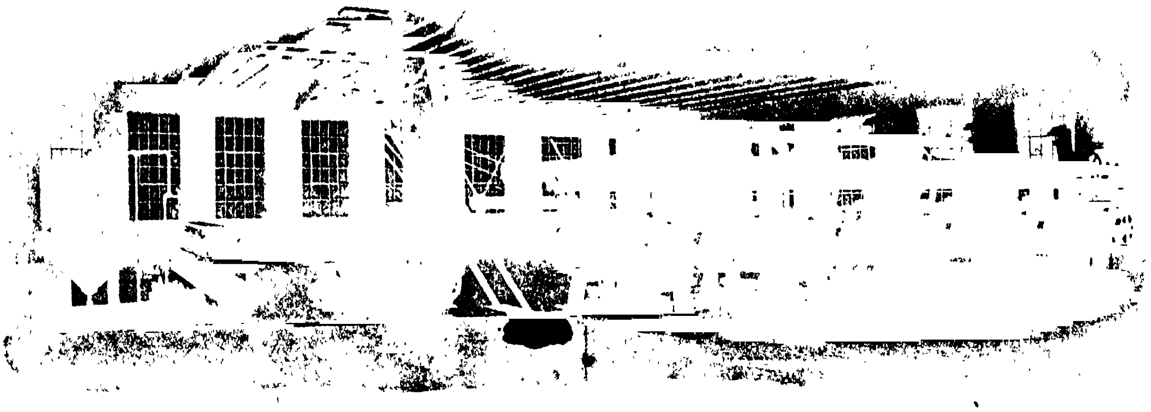
ANDERSON OIL EXPELLER

Uses The Anderson Oil Expellers are being successfully used to extract oil from:

Almonds,
Castor Beans,
Cohune Nuts,
Copra,
Corn Germs,
Cotton Seed,
Flaxseed,
Mustard Seed,
Palm Kernels,
Peanuts,
Poppy Seed,
Rape Seed,
Sesame,
Soya Beans,
Sunflower Seed,
and other oleaginous seeds and nuts

Capacity - One Anderson Oil Expeller will handle approximately:

700-800 lbs per hour Castor Beans
650 lbs per hour --Copra (ground)
450 500 lbs per hour-- Corn Germs
450 500 lbs per hour Cotton Seed
450 500 lbs per hour ---Flaxseed
500 lbs per hour- Peanuts
450-500 lbs per hour- -Soya Beans (ground).



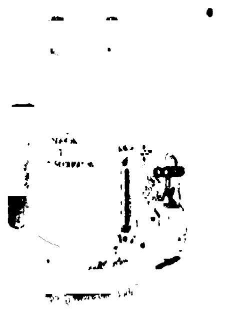
FIVE PRESS EXPELLER MILL
Can be operated by one man

Continued on Next Page

ANDERSON STEAM AND OIL SEPARATOR

This separator, being scientifically proportioned and constructed, removes the greatest amount of moisture practicable with a separator.

The cone shaped cap in the head guides the steam with minimum friction through spiral vanes, imparting a centrifugal motion to the steam, and, without reducing the steam pressure, throws the water to the outside of the case where it passes down into the receiving chamber.

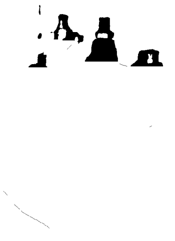


ANDERSON STEAM AND OIL SEPARATOR

In addition to its use on steam lines, the Anderson Separator is used with marked success for removing oil, water and gasoline from natural gas mains and for removing water and oil from compressed air lines.

ANDERSON AIR TRAP

For removing accumulated air from water under pressure. It is especially adapted for air pockets at high points in street mains, water mains and pipes in large buildings, hot water heating systems and closed-water receivers.



ANDERSON AIR TRAP

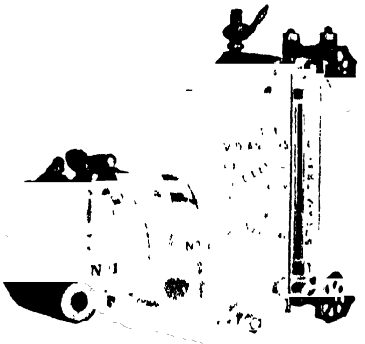
This trap can be placed above or below the ground. It works automatically and requires no attention. It is simple in construction, substantially made, fitted with our seamless copper float and can be provided with a valve to work at any required pressure from 0 to 150 pounds.

ANDERSON MODEL "D" STEAM TRAP

This trap works continuously and automatically. The valve and seat are sealed with at least three inches of water at all times, thus eliminating the possibility of live steam escaping with the condensation.

Can be used on any apparatus using steam at pressures varying from 225 pounds to gravity, and also where there is condensation in air lines.

The valve and seat can be quickly changed to accommodate varying pressures without removing the trap from the line.



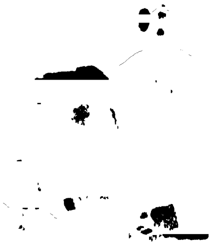
ANDERSON MODEL "D" STEAM TRAP

It only requires a glance at the gauge glass to ascertain whether the trap is working properly.

Each trap is tested and inspected under hydrostatic as well as steam boiler pressure before leaving our factory.

ANDERSON JUNIOR STEAM TRAP

This trap meets the demand for a practical trap with a limited capacity at a low price. It has no by-pass or gauge glass, but is made especially for use on sterilizers, paper dryers, radiators or other places requiring small capacity.



ANDERSON JUNIOR STEAM TRAP

Constructed to work at all pressures from 150 pounds down.

LITERATURE

Catalogs of our products will be supplied on request.

THE ANTHONY COMPANY

Liquid Fuel Engineers

138 West Avenue
LONG ISLAND CITY, N. Y.

PRODUCTS

Anthony Nebulyte Oil Burners, Gas Burners, Combination Oil and Gas Burners, Torches.

Anthony Nebulyte Oil and Gas Burning Equipment for all industrial heating processes.

Anthony Nebulyte Oil Sprays for Gas Plants and Sprays for all liquids.

Anthony Forges and Heat Treating Furnaces.

ENGINEERING SERVICE

The **Anthony Company** is prepared to design new equipment and redesign old equipment of any kind enabling anyone to avail himself of the advantages of oil or gas fuel, or both in combination.

The Engineering staff is also prepared to discuss all heating problems and design special oil or gas fired apparatus for specific needs

Having designed a great variety of successful industrial heat treating systems, Anthony engineers have wide experience in this field to place at a client's disposal.

They are pioneers in the development of mechanical nebulization as applied to the combustion of liquid fuel, as well as in the application of those combustion principles which affect the accurate control of heat quality.

THE ANTHONY NEBULYTE SPRAY
Note the Mist of Liquid

Employment of their services leads to conservation of fuel, speeding up of production, and better quality of output.

ANTHONY NEBULYTE BURNERS AND TORCHES

These devices are applicable wherever forges, furnaces, stills, dryers, boilers, kilns or other apparatus require heat. Low and high pressure designs to suit every requirement. A trial quickly proves their unequaled operating characteristics.

ANTHONY FUEL EQUIPMENT

The continuous and successful operation of any fuel system depends upon the use of correct equipment, installed and adjusted in accordance with established facts Special equipment of approved type for every part of liquid and gas fuel systems supplied.

ANTHONY NEBULYTE SPRAYS FOR GAS PLANTS

In the operation of Gas Plants, **Nebulyte Sprays** give perfect nebulization, positive control and uniform distribution of oil. No steam or compressed air required.

ANTHONY NEBULYTE SPRAYS FOR ALL PURPOSES

Sprays supplied of definite capacity and throw which can be utilized for many purposes, such as: cooling, aerating, atomizing, gasifying, mixing, absorbing gases and vapors, and for all purposes where it is desired to distribute a liquid in finely divided form over a large area, or thru a large volume.

ANTHONY FORGES AND HEAT TREATING FURNACES

These include rivet forges, crucible furnaces and a general line of heat treating furnaces built to take advantage of the superior operating characteristics of **Nebulyte** Burners. Simple, compact, sturdy, non-oxidizing. Low operating cost. Portable and stationary.

AQUA ELECTRIC HEATER COMPANY

250 WEST 54TH STREET, NEW YORK, N. Y.

FACTORY, BRIDGEPORT, CONN

PRODUCT

The "Aqua" Instantaneous Electric Water Heater.

CONSTRUCTION

The Characteristic feature of this device is comprised of a cylindrical body of porcelain in which are 22 tubular passages, from top to bottom. These passages are connected progressively to each other by porcelain caps, so that the 22 passages become one continuous passage.

The water to be heated enters into the passage, from the house piping, and continues in circuit through the 22 passages, from the last of which it is led to the discharge faucet.

The passages are all provided with non-corrosive coils distributed through in circuit, and the terminals of this heating element are connected by means of a snap switch to the source of current supply; therefore, when the water flows through the porcelain passages it passes directly over the heating element.

AQUA HEATER INSTALLED

CONSUMPTION

Basing the cost on running the heater by the hour at a consumption of 6.6 k.w. per hour assuming the natural water to be about 65 degrees:

Temperature	Water Obtained per Hour	Cost per K. W. Hour	Total Cost per Hour
110°	240 quarts	2c	13c
132°	160 "	3c	20c
195°	80 "	4c	26c
205°	76 "	5c	33c

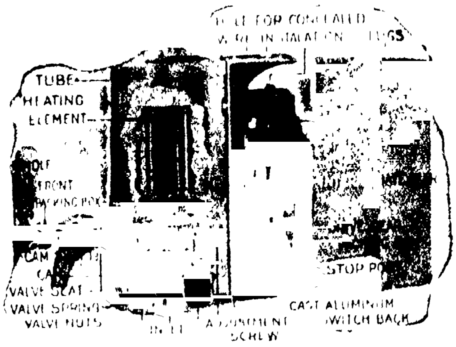
The electric current is only consumed when hot water is drawn.

EFFICIENCY

This device is approved by underwriters, universities, and engineers, and will give service indefinitely after once properly installed. There are no small springs or delicate parts. Every piece is made in our own factory of the finest material obtainable, consisting of bronze, brass, copper, porcelain, and insulation. Comparing the water output with its electric consumption, it produces 99 per cent efficiency.

FEATURES

Clean, sanitary, and sterilized hot water, boiling hot if you desire, instantaneously, then natural cold water through the same faucet. Our double valve faucet does not allow the cold water to pass over the red hot resistance element. Every part accessible. The same device will operate on either alternating or direct current.



CROSS SECTION SHOWING MECHANICAL FEATURES

INSTALLATION

Remove the ordinary faucet and mount the Aqua. It is equipped to take standard ½ inch pipe. The name plate designates the voltage and amperage, which is all that is necessary to ascertain the proper size wire to be used for connecting direct from the meter to our device.

MODELS

The two prominent voltages in existence all over the world are our standard models,

110 Volt	60 Amp.
220 Volt	30 Amp.

This device is applicable to either A. C. or D. C. Current.

We can supply any voltage desired. When ordering specify voltage.

WEIGHTS

Each heater is boxed individually. A standard crate contains 5 heaters.

Each heater weighs net	16 lbs.
Boxed (gross) weighs	25 lbs.
Consuming ½ cu. ft	
Standard crate weighs net	80 lbs.
Gross, 125 lbs. 2½ cu. ft.	

THE ARCTIC ICE MACHINE COMPANY

Manufacturers of Ice Making and Refrigerating Machinery

MAIN OFFICE AND WORKS, 916 S. MARKET ST., CANTON, OHIO

New York, 50 Church St.
New Orleans, 851 Carondelet St.

PRODUCTS:

ICE MAKING AND REFRIGERATING PLANTS — in any size, from one ton upwards.

HEAT EXCHANGERS, in all styles—atmospheric, double pipe, submerged, shell and tube.

LARGE WATER COOLING SYSTEMS—where the temperature is brought down lower than it can be done by cooling towers, or spray ponds.

CHEMICAL PRECIPITATING PLANTS—where certain soluble chemicals are precipitated into solids at low temperatures.

ROLL COOLING SYSTEMS—for the rubber industry—we have done more of this work than any other firm.

SOLUTION AND GAS COOLERS—in styles best adapted to the particular use.

CHEMICAL RECLAMATION PLANTS for reclaiming benzol and other volatile liquids in gaseous form for reuse.

GAS CONDENSERS atmospheric, double pipe, submerged and tube types.

OIL COOLING SYSTEMS for use in connection with large steel heat treating plants or any other purpose.

COLD DRINKING WATER PLANTS for large industrial institutions.

PIPE WORK AND FITTINGS—for every use and pressure. Our drop forged steel line of fittings for high pressure work.

INSULATING MATERIAL—for every condition.

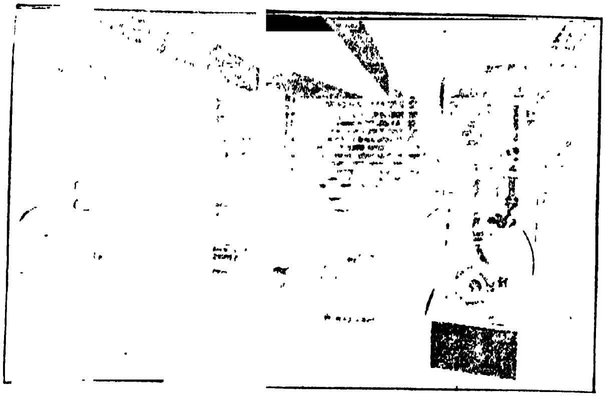
CO-OPERATIVE SERVICE:

We specialize in adapting refrigeration to Industrial requirements. The experience of our organization is at your command. If you are in doubt as to your needs, we will investigate and guarantee results.

We can advise you as to the most efficient method of removing heat or transferring it from one substance to another.

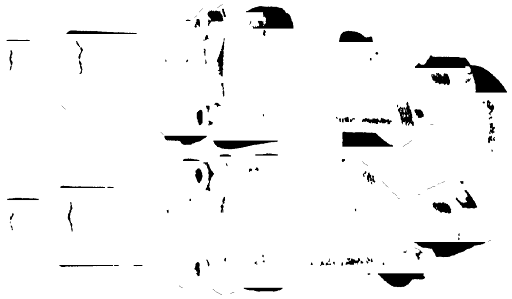
Our machinery is suitable for connection to any kind of power.

The illustration to the right shows our larger type of Horizontal Compressor, built in sizes from ten to three hundred tons daily refrigerating capacity.



SMALL ARCTIC PLANT FROM 1 TO 23 TONS CAPACITY

These small units can be operated by direct connected steam engine or belted to either steam, gas engine, or motor.



DOUBLE PIPE RETURN BEND

ARCTIC HORIZONTAL COMPRESSOR

ARMSTRONG CORK & INSULATION COMPANY

133 Twenty-fourth Street
PITTSBURGH, PA.

BRANCHES IN THE PRINCIPAL CITIES OF THE UNITED STATES AND CANADA

PRODUCTS

Nonpareil Cork Covering for the insulation of Brine, Ammonia, Drinking Water and other Cold Lines, Tanks, Coolers, etc.

Nonpareil High Pressure Blocks, Cement and Covering for the insulation of High Pressure and Superheated Steam Lines, Stills, Tanks, Evaporators, Vacuum Pans, Enameling and Japanning Ovens, etc.

Nonpareil Insulating Brick for the insulation of Industrial Furnaces, Ovens, Kilns, Regenerators, Boiler Settings, etc. Nonpareil Insulating Cement.

Nonpareil Corkboard for the insulation of all kinds of Cold Storage and Constant Temperature Rooms in Factories and Laboratories.

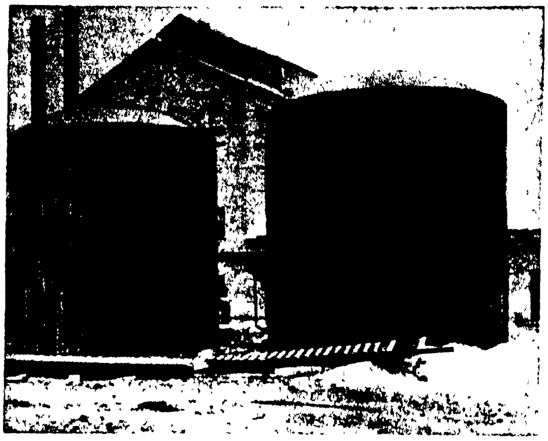
NONPAREIL CORK COVERING

Nonpareil Cork Covering is the most efficient, durable and economical insulation obtainable for brine, ammonia and ice water lines and for cold pipes and tanks generally. Its efficiency is due, in a large measure, to the peculiar characteristics of its sole ingredient, cork.

Structural Features—Clean, granulated cork is compressed and baked in molds formed to fit pipes of different sizes and the fittings generally used No foreign binder is needed, as the natural gum in the cork, liquefied by heat, cements the particles firmly together Moreover, this gum covers each granule with a shellac-like film which renders it practically impervious to moisture The covering is then coated, inside and out, with a waterproof mineral rubber finish, ironed on As a result, Nonpareil Cork Covering is protected, internally and externally, against deterioration due to moisture absorption and the penetration of frost When properly applied, the joints sealed with Nonpareil Waterproof Cement, Nonpareil Cork Covering will last for years—longer than the pipe, in many recorded instances.

Insulating Efficiency—The insulating efficiency of Nonpareil Cork Covering is due to the high percentage of "dead" air contained in the myriads of sealed cells that make up the structure of natural cork. This cellular construction so effectively retards the transmission of heat that Nonpareil Cork Covering saves approximately 80% of the refrigeration which would be lost from bare pipe

Nonpareil Cork Covering and Lagging on brine lines and fittings in the plant of the Loose-Wiles Biscuit Company, New York City.



Oil storage tanks insulated with Nonpareil Cork Lagging Cudahy Refining Company, Coffeyville, Kansas.

Forms and Sizes Nonpareil Cork Covering is supplied in molded covers for practically all fittings, screwed and flanged, and in split sections, 36 inches long, for straight runs of pipe It is made in three thicknesses—Standard Brine Covering for lines carrying refrigerant between 0 and 25 F; Special Thick Brine Covering for temperatures below 0° F, and Ice Water Covering for refrigerated drinking water lines and others where temperatures are above 25° F. All sundries necessary for application are supplied with the covering

Nonpareil Cork Covering is also furnished in the form of lagging, beveled to any desired radius, and in thicknesses up to 6 inches, for the insulation of tanks and other cylindrical cold surface.

A 64-page book, "Nonpareil Cork Covering," contains complete detailed information and specifications invaluable wherever refrigeration is used. A copy of this book and a sample of the covering will be sent free on request.

DRINKING WATER SYSTEMS

One of the special applications of Nonpareil Cork Covering is for the insulation of refrigerated drinking water systems in industrial plants. This system of distributing drinking water has, in recent years, become firmly established not only as a convenience but as an economic necessity. It delivers properly cooled water in the quantity required, when and where needed; it occupies little space, saves time and money and is clean and sanitary.

Nonpareil Cork Covering in Ice Water Thickness is especially adapted for the insulation of the distributing lines and apparatus. It is neat in appearance, vermin- and moisture-proof and fire retardant. Its high insulating efficiency insures a minimum of refrigeration and power and its durability is a guarantee of long life in service.

Continued on Next Page

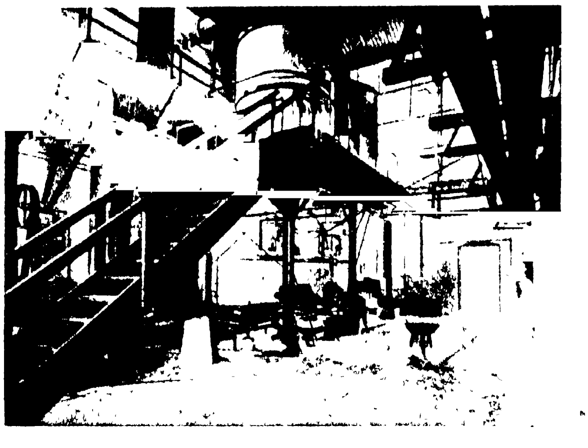
Engineering data not available elsewhere are contained in the 48-page book, "Drinking Water Systems," which will be sent on request and without charge. The information regarding water, power and refrigeration required, data on installing the system, approximate operating costs, etc., will be found of unusual value and assistance.

NONPAREIL HIGH PRESSURE BLOCKS, CEMENT AND PIPE COVERING

Nonpareil High Pressure Blocks are composed principally of diatomaceous earth and asbestos fiber, their unexcelled efficiency and durability being largely due to the structural characteristics of the former material. Diatomaceous earth is practically pure silica in cellular form, the shells or skeletons of microscopic plants (diatoms) that grew in the sea ages ago

Feed water heater insulated with Nonpareil High Pressure Blocks and Cement. Minneapolis General Electric Company, Minneapolis, Minn

Insulating Efficiency—There are something like 39 billion of these hollow shells to the cubic inch. Hence, the material contains a large amount of entrapped or "dead" air which accounts for its remarkable ability to retard the transmission of heat Because of this peculiar quality of diatomaceous earth, Nonpareil Blocks contain a much higher percentage of "dead" air than other materials which depend for their efficiency on the air entangled among their solid crystals and fibers Carefully conducted tests show about 12% greater efficiency for Nonpareil Blocks

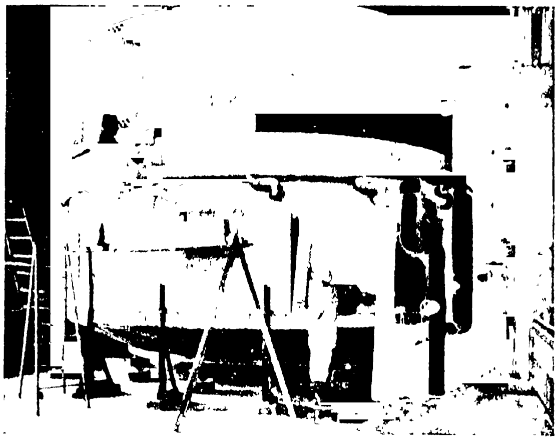

Double effect evaporators in the plant of the Warner-Kleipstein Chemical Company, South Charleston, W. Va., insulated with Nonpareil High Pressure Blocks and Cement.

Other Advantages—Nonpareil High Pressure Blocks will withstand relatively high temperatures without calcining or disintegrating. Hence, they are especially adapted for the insulation of evaporators, feed water heaters, vulcanizers, driers, tanks, breechings, kettles, enameling and japanning ovens and other heated equipment Nonpareil Blocks have been subjected to a practically continuous temperature of 1000 F. for over a year without showing any deterioration.

Furthermore, since all ingredients are insoluble in water, Nonpareil Blocks will stand repeated wetting, and even submersion, without change of form or loss of structural strength This quality is of particular importance in the case of equipment in chemical and industrial plants where steam and water are in contact with the insulation

Because of these unusual qualities, Nonpareil High Pressure Blocks and Cement effect very important economies in the operation of many kinds of equipment by conserving heat and increasing the efficiency to such an extent as to bring about a marked decrease in operating cost. By keeping down workroom temperature, they also aid materially in improving shop conditions.

Structural Details—Nonpareil Blocks are made in 3, 6 and 12 inch widths, 18 and 36 inch lengths and in 8 thicknesses from 1 to 4 inches, inclusive. They are light and easy to handle and can be quickly and inexpensively applied on practically any type of equipment.


Applying Nonpareil High Pressure Blocks to a tank in the plant of the Stroh Products Company, Detroit, Mich. A coat of Nonpareil High Pressure Cement was afterward applied.

Nonpareil High Pressure Cement and Nonpareil A-1 Cement are practically the same material in loose form for plastic application on fittings and irregular surfaces and as a finish coat over the blocks They trowel to a fairly smooth surface. Nonpareil Finishing Cement is for finishing purposes only, where an especially smooth and hard surface is required.

NONPAREIL HIGH PRESSURE COVERING

Nonpareil High Pressure Covering for steam pipes is of the same composition as Nonpareil Blocks, molded in sectional form for pipes of all sizes. Its superior insulating efficiency, and the ability to resist moisture and high temperatures especially qualify it for use on high pressure and superheated steam lines, or under

Continued on Next Page

the unusually severe moisture and humidity conditions encountered in many industries, and for underground heating and power lines. Nonpareil High Pressure Covering is furnished in 36-inch sections, canvassed and banded, and in all standard thicknesses.

Literature and Samples—The illustrated books, "Nonpareil High Pressure Blocks and Cement," "Nonpareil High Pressure Covering," together with liberal samples, will be furnished, without charge, on request.

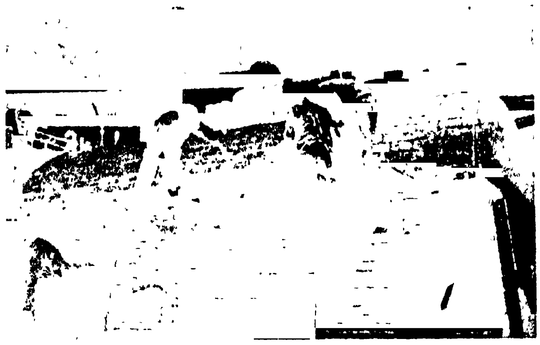
NONPAREIL INSULATING BRICK

Nonpareil Insulating Brick combine high insulating efficiency with structural strength and heat resistance in a form readily adaptable to the insulation of furnaces, ovens, kilns, boiler settings and drums, lehrs, benches, stills, retorts and similar apparatus.

Nonpareil Brick are composed principally of diatomaceous earth mixed with a small amount of granulated cork. In the process of manufacture, the cork is burned out, leaving additional air spaces which further enhance the insulating efficiency of the finished product.

Insulating Value—Nonpareil Brick have fully ten times the heat retarding capacity of common or fire brick; in other words, a 4½ inch course is equal in insulating efficiency to 45 inches of ordinary brick. Their use results in a saving of from 60% to 75% of the heat lost by conduction and radiation from uninsulated construction. Since radiation loss frequently amounts to 20% or 25% of the total heat, it is clear that the saving effected represents a very important economy in the use of fuel. In fact, carefully checked operating records have shown actual fuel savings of 10% to 15%, and more, where Nonpareil Brick have been used in the construction.

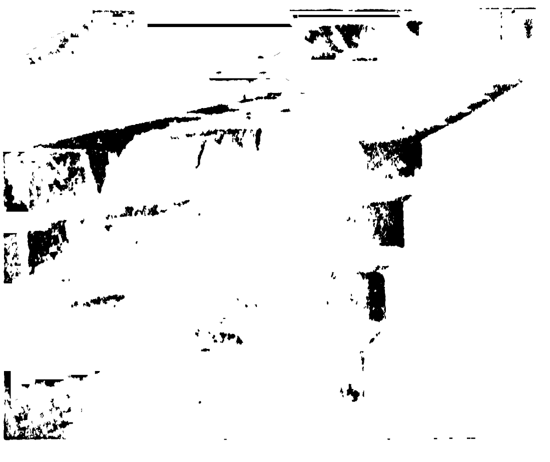
Other Advantages—Though fuel economy alone is more than sufficient to justify the use of Nonpareil Brick, other results are equally valuable. Less time is required to reach working temperatures. Overheating in the combustion chamber is eliminated, thereby prolonging the life of the refractories. More constant and evenly distributed furnace temperatures assure uniformity of product. The retention of heat inside the equipment means its exclusion from the workrooms with a consequent improvement in working conditions that tends to increase morale and efficiency.



Insulating the drum of an oil still with Nonpareil Insulating Brick.

Structural Features—Being supplied in standard fire brick shapes and sizes, Nonpareil Brick are easily bonded with the fire brick or common brick. Their use involves no additional construction as they take the place of at least an equal number of other brick, the saving in the cost of which largely offsets the cost of insulation. Though averaging in weight only about 1.6 pounds each, Nonpareil Brick have a crushing strength of 10 tons per square foot, and are therefore capable of carrying the weight and withstanding the strains encountered in high temperature equipment.

Nonpareil Brick are not a refractory. They will, however, endure a direct heat of 1650° F. without change of form or quality, which, when properly installed, is ample for practically all conditions.



Showing how Nonpareil Insulating Brick are installed in a boiler setting between the courses of fire brick and common brick.

The advantages of solid insulation construction over the old-time practise of leaving spaces between double walls, or packing with loose fillers are obvious. Nonpareil Insulating Brick cannot settle or pack. They are built in as rigid, permanent construction, an integral part of the equipment.

Further Information—The unusual merits of Nonpareil Insulating Brick and their many industrial applications are fully described in a new illustrated publication of 72 pages, "Nonpareil Insulating Brick," which will be sent free on request. Many classes of equipment are treated separately and specifically, with operation records, detailed reports of tests and full specifications. The information given in this book is of exceptional value to designers and operators of industrial plants using high temperature equipment.

NONPAREIL CORKBOARD

Nonpareil Corkboard is generally recognized as the standard insulation for cold storage and constant temperature rooms of all kinds. It is made of clean, granulated cork, compressed in molds and baked in sheets 12 x 36 inches and in various thicknesses from 1 to 6 inches inclusive. Special thicknesses can also be furnished.

NONPAREIL MACHINERY ISOLATION

Nonpareil Machinery Isolation for the reduction of noise and vibration from moving machines is similar in composition and form to Nonpareil Corkboard except that it is much more densely compressed. Placed under the bases of fans, motors, drills, presses, rolls and other machinery, it deadens sound and absorbs vibrations.

Samples and literature descriptive of Nonpareil Corkboard and Nonpareil Machinery Isolation will be furnished on request.

THE ASHTON VALVE COMPANY

Safety and Relief Valves, Pressure and Vacuum Gages

NEW YORK, N. Y.
126 Liberty Street

161 First Street, Cambridge 41
BOSTON, MASS.

CHICAGO, ILL.
318 West Washington Street

PRODUCTS

- Pop Safety Valves
- Relief Valves
- Ammonia Relief Valves
- Ammonia Diffuser
- Hydraulic Relief Valves
- Pressure and Vacuum Gages
- Ammonia Gages
- Pyrometer Steam Gages
- Altitude Gages
- Chemical Pressure Gages
- Alarm Gages
- Recording Pressure Gages
- Whistles
- Compound Gages

ASHTON SAFETY VALVES AND GAGES

For over 50 years the Ashton Valve Company has been engaged in the manufacture of valves and gages, with the result that the Ashton product is now generally recognized as of absolutely dependable quality In industrial service, Ashton products have abundantly demonstrated that they possess the efficiency and durability demanded by modern advances in steam and chemical engineering- high pressure, high superheat, etc

The value of Ashton pressure and vacuum gages for scientific work demanding the utmost accuracy is testified to by the fact that many of the leading manufacturers of testing appliances specify Ashton gages as their standard

Our large modern factory, fully equipped with special tools, is conveniently located for making prompt delivery to railway and steamship lines One of the greatest factors contributing to the success of our products is the genuine cooperation of skilled workmen, many of whom have grown up with the business and who take real pride in seeing that the various intricate and exacting processes necessary to produce an efficient safety valve or an accurate and reliable gage, are properly executed

We realize the exacting demands of the chemical industries, and feel confident of the ability of Ashton products to meet such We particularly desire to do business with those who discriminate for quality and ultimate reliability in preference to first cost

APPLICATION OF ASHTON PRODUCTS IN THE CHEMICAL INDUSTRIES

Some of the uses of Ashton Safety Valves and Gages to the chemical industries are mentioned in the following:

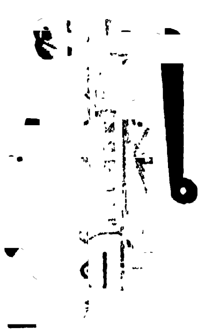
As a protection against excessive pressure on low pressure lines between the reducing valves and the stills, jacketed kettles, evaporators, digestors, cookers, dryers, etc. For such purposes the No. 8 steam valve with open discharge, trip lever and lock-up, or similar No 9 style valve having pipe outlet are adaptable, while for water relief the No 24 style is most suitable

NO. 8 VALVE

NO. 24 VALVE

For large power plant boilers the No 20 style pop safety valve will be found to give the most efficient and dependable results For use on autoclaves, small pressure tanks, boilers, stills, or cookers the Ashton No 31 style safety valve with open outlet, or the No 32 with pipe outlet are recommended and made in various sizes from $\frac{1}{8}$" to $\frac{3}{4}$".

The Ashton No 23 ammonia relief valves are unsurpassed for ammonia compressor service with which diffusers are also furnished when so desired


NO. 20 VALVE

ASHTON PRESSURE AND VACUUM GAGES

These gages are made in various styles, both registering and recording, to meet any requirements on steam, water, gas or air installations

The No. 51 style steam gage, No 53 vacuum, No. 55 hydraulic, No 57 ammonia, No 60 altitude, No. 61 chemical and No 73 recording, are each specially adapted for their particular kind of service The Ashton ammonia gage is made with all parts of iron or steel The Ashton chemical gage is suitable for use where corrosive liquids or chemicals are used.

The No. 60 altitude gage indicates both the actual and required water level in tanks, stand pipes or reservoirs The dial is graduated in feet of water column, and the extra lazy hand in red is adjustable to show the water level that should be maintained. The No. 60A water tank indicator gage is a special design to indicate tank levels only

Complete catalog No 18 furnished upon request

NO. 60 GAGE

THE ASSOCIATED TILE MANUFACTURERS

Wall and Floor Tiles, Ceramic Mosaic, Faience

BEAVER FALLS, PENNSYLVANIA

MEMBER FACTORIES

Alhambra Tile Co
Newport Ky

American Encaustic Tiling Co., Ltd
Zanesville, Ohio

Beaver Falls Art Tile Co
Beaver Falls Pa

Cambridge Tile Mfg Co
Covington Ky

Grueby Faience & Tile Co
Perth Amboy, N J

Matawan Tile Co
Matawan N J

Mosaic Tile Co
Zanesville Ohio

National Tile Co
Anderson, Ind

Old Bridge F B & Tile Co
Old Bridge, N J

Perth Amboy Tile Works
Perth Amboy, N J

C Pardee Works
Perth Amboy, N J

U S Encaustic Tile Works
Indianapolis, Ind

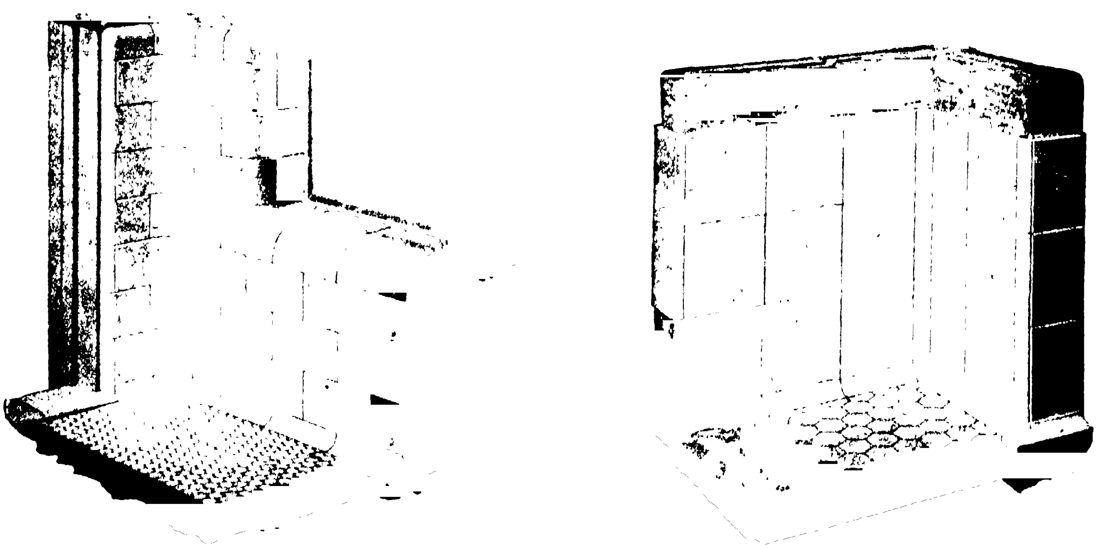
Wheeling Tile Co
Wheeling, W Va

PRODUCTS

Vitreous, semivitreous, ceramic mosaic, glazed, enameled, faience and trim tile of every kind and for every purpose. Unglazed, or bright, dull and matt glazed in all colors. Plain or decorative.

ADVANTAGES

Non-porous; non-absorbent, proof against acid and alkaline reaction, serviceable for low or high temperature conditions; oil-proof, easily cleaned, sanitary; attractive; permanent; light-reflecting glazes and colors.



FLOOR AND WALL SECTIONS SHOWING DIFFERENT STYLES OF WHITE TILING AND SANITARY FEATURES

An almost endless variety of styles can be produced with our tiles

By the use of the proper tiles in workrooms of factories the efficacy of lighting can be increased considerably and maintained at a minimum cost for cleaning. Neither the color nor the brightness of the glazes deteriorates with age or is affected by fumes or atmospheric corrosives.

Our tiles are extensively and successfully used for floors, walls and ceilings in dairies, creameries, food factories, laundries, bottling and refrigerating plants, packing houses and factory buildings of almost any kind where cleanliness, permanence and economy in maintenance are wanted.

USES

Suitable for the lining of chemical hoods, mixing and acid tanks, vats, agitators, stuff chests, reservoirs and similar containers requiring a non-porous, impermeable and easily cleaned lining material.

Recommended for floors, walls, wainscots, ceilings, columns, in laboratories, workrooms; engine rooms; stairways, ramps; first-aid stations; sick-wards; toilets; wash-up rooms, showers; swimming pools, cafeterias, dining rooms, etc

COOPERATIVE SERVICE

Upon request, our Service Department will make a special study of requirements and conditions where necessary to submit proper recommendations, cooperate in selecting and specifying tiles best suited for any given purpose, and suggest special setting methods and means for special work. Information on the best practice and assistance in the solution of any problem involving tile work can always be obtained through this department.

Information on acid resisting cements used in connection with our tiles furnished upon application. Samples of tiles for tests cheerfully sent upon request. Please state intended use and conditions so that correct tiles can be sent at once.

Correspondence invited.

ATERITE COMPANY, INC.

Acid Resistant and High Temperature High Pressure Alloys

N.E. CORNER JOHN & WILLIAM STS., NEW YORK, N. Y.

BRANCH OFFICES
Conway Building, Chicago, Ill
Beatty Building Houston, Tex

WORKS
Paterson, N J

PRODUCTS

We are prepared to furnish special alloys of Acid Resisting Qualities and for High Temperature, High Pressure Service Conditions.

"ATERITE"

Aterite is a patented non-corrosive metallic alloy for acid and high temperature, high pressure lines.

Forms of Manufacture—

Bolts, Nuts and Washers
Chains
Cocks
Coils
Gauges
Pipe Fittings of all types
Pipe, Wrought and Cast
Rods
Screens
Sheets
Special Castings
Valves of all types
Wire

Properties—

	Cast	Wrought
Fusing Temperature	2,780° F	2 380° F
Weight	.536 lb cu ft	.543 lb cu ft
Ultimate Tensile Strength	86,800 lb sq in	163,200 lb sq in *
Elastic Limit	78,460 lb sq in	163,200 lb sq in *
Elongation in 2 In	24 6%	1 6%
Reduction in Area	31 5%	17%

* 12 numbers hard

Recommended For—

Acids—

Arsenious
Boric
Carbolic
Citric
Formic
Hydrofluoric
Hydrofluosilicic
Lactic
Oleic
Phosphoric
Pyrogallic
Salicylic
Sulphurous
Tannic
Tartaric

Sulphuric—Cold—of any degree Baumé including Fuming.
—Hot—up to 60° Baumé any temperature up to 150° F.
—Hot—60° to 66° Baumé any temperature up to 225° F.

Bases—

Calcium Hydrate
Caustic Soda
Caustic Potash

Salts—

Aluminum Chloride
Aluminum Sulphate
Ammonium Bromide
Ammonium Citrate
Ammonium Oxalate
Ammonium Phosphate
Ammonium Sulphate
Barium Chloride
Calcium Chloride
Calcium Citrate
Calcium Sulphate
Copper Sulphate
Lead Acetate
Nickel Sulphate
Sodium Citrate
Sodium Formate
Sodium Hypochlorite
Sodium Phosphate

Organic Compounds—

Acetone
Benzol
Carbon Tetrachloride
Chloroform
Collodion
Ether
Formaldehyde
Glycerine
Phenol

Mixtures—

Mine Water
Tannic and Sulphuric Acids

Colors—

Nearly all colors and derivatives made from coal tar products and many others.

"FANOSITE"

Fanosite is a patented aluminum alloy proof against corrosive action of acids

Forms of Manufacture—

Cast Bolts and Nuts
Cocks
Coils
Gauges
Pipe Fittings of all types
Pipe, Wrought and Cast
Special Castings
Valves of all types

Properties—

Weight.................... 203 lb. per cu. ft.
Ultimate Tensile Strength..22,923 lb. per sq. in.
Elongation in 2 in.........6.25%

Recommended For—

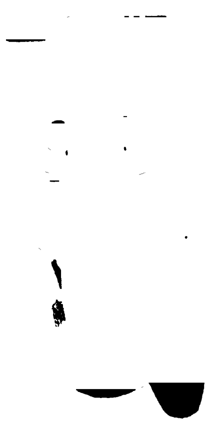
Acetic Acid, any strength or temperature
Nitric Acid, cold
Edible Gelatin

PUBLICATIONS

Bulletin No. 6. Addressed to the oil industry, but containing complete information on "Aterite" for acid and high temperature, high pressure work; also articles of manufacture, in all "Aterite," in iron body "Aterite" trimmed, and in semi-steel "Aterite" trimmed.

Bulletin No. 7. Covers the subject of "Aterite" in the wrought form only.

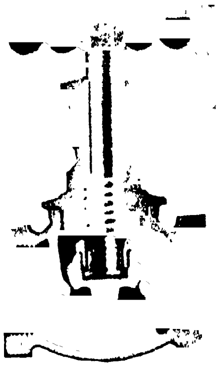
Continued on Next Page



O S & Y GATE VALVE

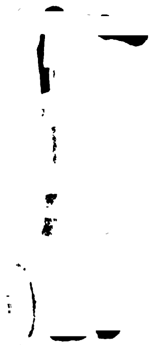
SCREWED-IN BONNET GATE VALVE

GLOBE PLUG NEEDLE VALVE

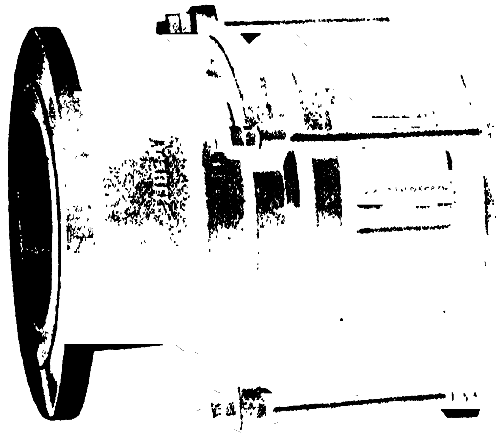


GLOBE VALVE

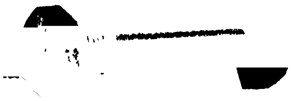
SWING CHECK VALVE



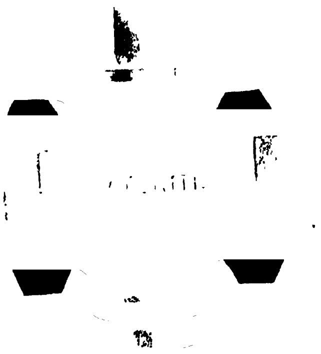
QUICK OPENING GATE VALVE



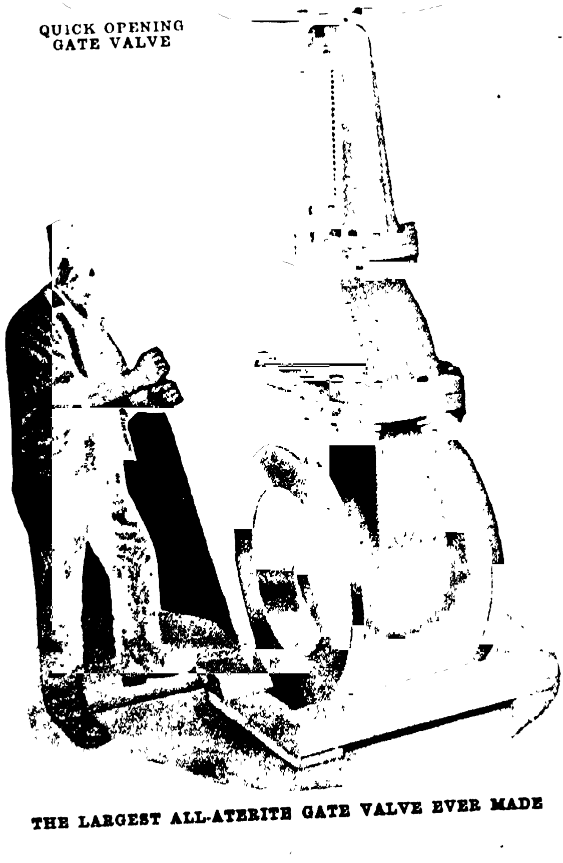
EXPANSION JOINT



BOLT AND NUT

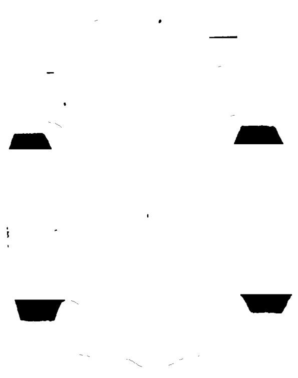


COCK



THE LARGEST ALL-ATERITE GATE VALVE EVER MADE

GAUGE



PACKED PLUG COCK

ATLANTIC TANK & BARREL CORPORATION

Established 1853

15th & Jefferson Streets
HOBOKEN, N. J.

Factory
HOBOKEN, N. J.

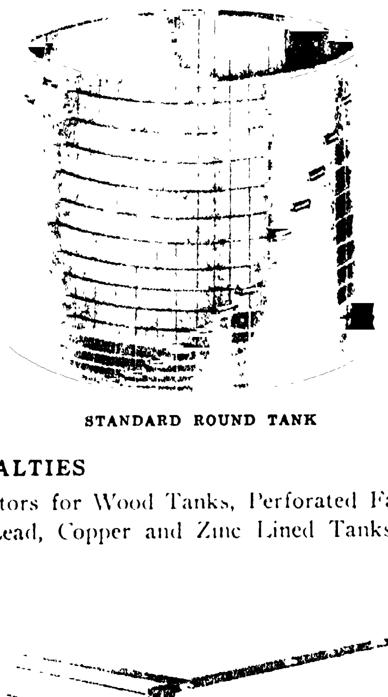
Factory
LOUISVILLE, KY.

PRODUCTS

Wooden Tanks, Round, Rectangular, Oval and Half-Round; Lead-Lined Tanks; Tanks with Stirrers; Tanks with Perforated False Bottoms; Special Tanks of all kinds supplied in accordance with specifications.

TANK MANUFACTURERS FOR MORE THAN SIXTY YEARS

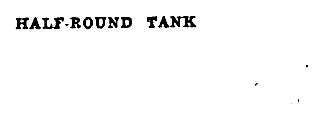
Our Company has been manufacturing wooden tanks for over sixty years and has always maintained a reputation for furnishing the highest quality of tanks possible. Our experience in the manufacture of tanks for the chemical and dyestuffs industries has covered every branch of this field and we have furnished the entire equipment for some of the largest plants, both in this country and in Canada.



STANDARD ROUND TANK

SPECIALTIES

Agitators for Wood Tanks, Perforated False Bottoms, Lead, Copper and Zinc Lined Tanks.



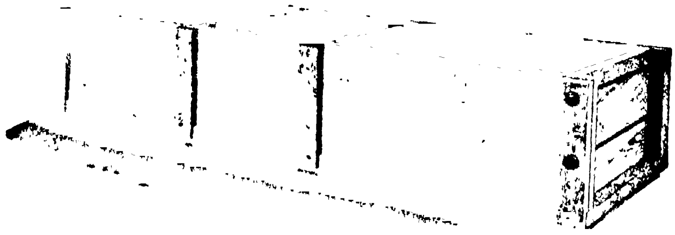
HALF-ROUND TANK

OAK BARRELS

At our Louisville plant we make oak barrels, that will meet the most rigid tests for wood shipping containers. These barrels are used for shipping oils, alcohol, acids, dry colors, dyes and a host of other chemical products, also export wine shooks. First class workmanship goes into the making of each individual barrel. Send for our quotations.

Standard capacities are: 50/52 gals and 53/55 gals.

OAK BARREL



RECTANGULAR TANK

MATERIALS

We carry large stocks of:

Long Leaf Yellow Pine, Oregon Fir, White Cedar. Gulf Cypress, White Oak, and California Redwood.

LITERATURE

Write for our catalog E, giving tables of sizes, capacities, weights and full details about our tanks.

When writing for prices give as much information as possible; give capacity, widest diameter and height of staves, also whether inside or outside measurements; if possible state purpose for which the tank is to be used, for we can often make suggestions resulting in a considerable saving to our customers.

THE ATLAS CAR AND MANUFACTURING CO.

Engineers Manufacturers
1140 Ivanhoe Road
CLEVELAND, OHIO

PRODUCTS

- Cars (for any requirement)
  - Gable bottom, and Rotary dump
  - Electrically operated cars of all kinds
- Coke Oven Equipment
- Kiln Cars of all descriptions
- Locomotives (Storage Battery and Electric)
- Trucks and Tractors (Storage Battery)
- Transfer Cars
- Turntables
- Industrial Track and Equipment

CARS

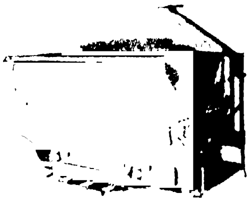
An endeavor will be made to show only one car which is typical of a line or for a specific requirement. We build cars for all purposes and of any capacity.

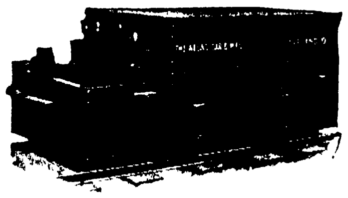
We build and recommend equipment for any haulage requirement.

BATCH MIXING CAR

NO. 217-W
EITHER SIDE DUMP SCALE CAR

NO. 161-A
GABLE BOTTOM DUMP CAR,
WITH TRIP AND BRAKE

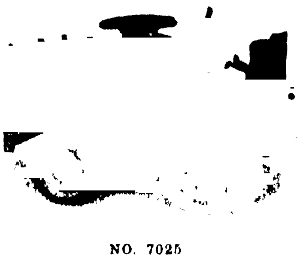

NO. 217-EH
LARGE CAPACITY
ELECTRIC SIDE DUMP CAR


NO. 6000
STORAGE BATTERY LOCOMOTIVE
STANDARD TYPE "A"
For Mine and Industrial Haulage

NO. 910
ELECTRIC TRANSFER CAR

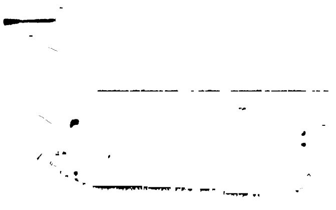
STORAGE BATTERY TRACTOR, TYPE TE2

Four wheel steel, two or four wheel drive, Edison or Lead Battery equipment, normal load—10 tons Trailers and loading will operate in intersecting aisles 5'6" wide.


NO. 7025

STORAGE BATTERY TRUCK TYPE H.P.

Four wheel steel, two wheel drive, load platform 42" x 84" x 24" high 4000 lbs. capacity Will operate in intersecting aisles 6'0" wide.

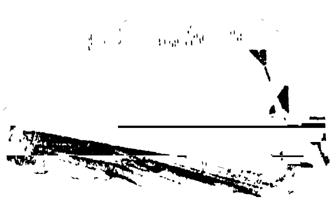

NO 7126

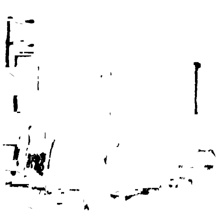
COKE OVEN EQUIPMENT

Pushers and levelers,
Coal Charging Larries,
Scale Cars, Door Machines,
Quencher Cars, Electric Locomotives.

An engineering staff with wide experience on coke plant machinery is available and capable of handling any haulage problem in this field.

NO. 450
COAL CHARGING LARRY


NO. 480
COKE QUENCHING CAR


NO. 6525
ELECTRIC LOCOMOTIVE

ATLAS ELECTRIC DEVICES CO.

Apparatus for Testing Fastness to Light of Dyes and Inks

365 W. Superior St.
CHICAGO, ILL.

PRODUCT

The Fade-Ometer

USED BY

- Dyestuff manufacturers and dealers
- Dyers
- Textile manufacturers
- Clothing manufacturers and dealers
- Paper mills
- Ink makers
- Printers
- Lithographers
- Billboard advertisers
- Chemical laboratories
- Testing laboratories
- U. S. Bureau of Standards

PURPOSE

Fading and color tests of dyed textiles such as woolens, silks, prints, carpets, velvets, plushes and upholstering.

Fading and color tests of wall-paper, lithographs, printed posters, bankers' safety paper, colored paper, cartons, labels, printed tinplate, inks and combinations of inks.

Fading and color tests of paints, varnishes, oil and water colors, stains and lacquers.

THE ACTIVE ELEMENT

The **Fade-Ometer** uses the Violet Carbon Arc which provides a light rich in ultra violet rays to the same degree as midsummer sunlight. It is **not** a mercury arc or quartz tube light. The fading effect of the Violet Carbon Arc is the same in quality as sunlight, but is much more rapid and is available day and night, summer and winter, without variation or interruption.

LITERATURE

Bulletin No. 60 fully describes and illustrates the **Fade-Ometer** with directions for its operation.

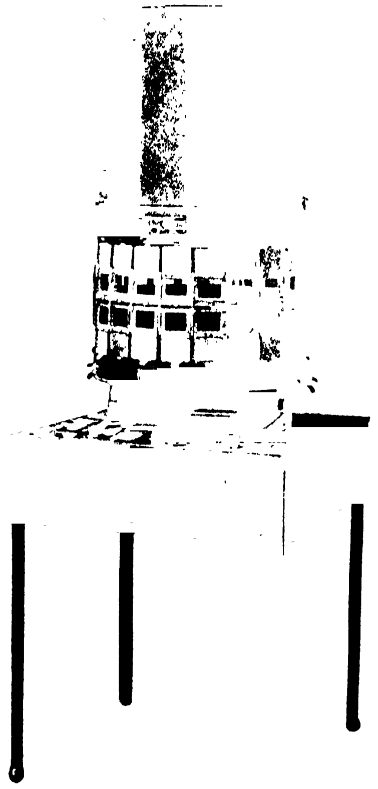
Bulletin No. 40 is the reprint of an article by Mr. H. B. Gordon of the U. S. Testing Co. of New York, comparing in detail the fading results of sunlight, the **Fade-Ometer** and the Mercury Arc light.

Write for these bulletins.

DESCRIPTION

The **Fade-Ometer** consists of a Violet Carbon Arc light mounted on a supporting stand with self-contained rheostat and with a movable shield carrying the holders for the specimens or swatches to be exposed to the light. The lamp mechanism is entirely automatic in its action and can be supplied for 110 Volts to 250 Volts D. C. and 110 Volts to 550 Volts A. C.

Two sizes are made, the Industrial Type with holders for testing 40 specimens at one time, and a smaller Laboratory Type holding 20 specimens and arranged for bench mounting.



THE FADE-OMETER, INDUSTRIAL TYPE
With movable shield lowered to operating position

WHAT THE USERS SAY

Bachmeier & Co., New York (dyestuffs) "We have found the **Fade-Ometer** very satisfactory in every way. We have made tests not only of our own colors, but also for a number of our customers and so far have received no criticism of our reports.

"The fact that we recommend it to our friends is evidence of our approval."

Hart, Schaffner & Marx, Chicago (makers of men's clothing). "We have been satisfied with its performance and results, and altogether we feel gratified over having installed it."

Fox River Paper Co., Appleton, Wis. (makers of writing papers). "The **Fade-Ometer** has proven very satisfactory for our work, permitting us to test out at any time the fastness to light of dyes used in our papers and in matching colors."

Philip Ruxton, Inc., Chicago (Ink Makers to Particular Printers). "We have been using the **Fade-Ometer** for some time and find that we are able to check up our color matches as to their permanency before making shipment."

ATMOSPHERIC CONDITIONING CORPORATION

Manufacturers of Equipment for Maintaining Artificial Atmospheric Conditions in Industrial Plants

437 Chestnut Street
PHILADELPHIA, PA.

CANADIAN REPRESENTATIVES
DARLING BROTHERS, LTD.
120 Prince Street
MONTREAL, P. Q.

TRADE MARK

EUROPEAN REPRESENTATIVES
ATMOSPHERIC STEAM HEATING CO., LTD.
22 Broadway, Westminster
LONDON, S. W., ENGLAND

Representatives in the Principal Cities of the United States

PRODUCTS

- Webster Air Washers
- Humidifiers and Dehumidifiers
- Cooling and Drying Apparatus
- Generator Coolers
- Webster System of Automatic Humidity Control
- Spray Nozzles
- Dr. Hill Dust Counters

WHAT WE ACCOMPLISH

The addition of the proper percentage of humidity to make up deficiency.

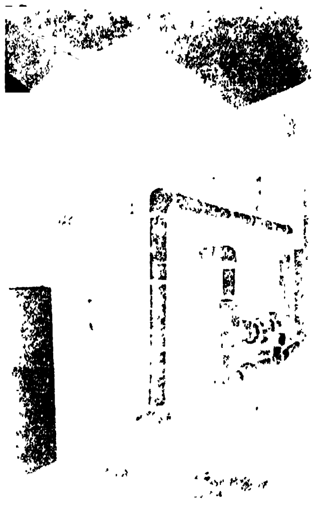
The removal of excessive humidity when high moisture content in the air prevents proper drying or carrying out of certain processes

Maintaining either high or low temperatures where local conditions or specific materials demand such treatment

The maintenance of uniform humidity conditions within 2% of that for which it is set

The maintenance of working spaces at the Comfort Zone to insure efficiency of employees

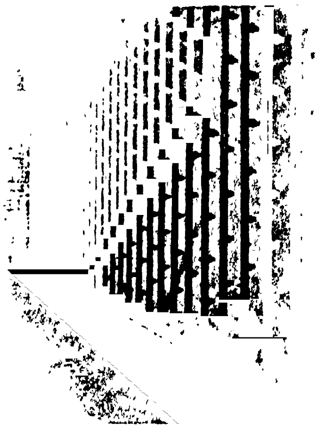
The cleansing and cooling of air for the ventilation of Turbo Alternators, equipment commonly known as Generator Coolers



ATMOSPHERIC DEHUMIDIFIER
Installed in Large Industrial Plant Manufacturing Food Products

WEBSTER AIR WASHERS

Type "A" Apparatus—Designed primarily for air washing in connection with ventilating systems in public buildings, where a moderate cooling effect by evaporation is desired



VIEW OF SPRAY CHAMBER
Showing Operation of Nozzles in Atmospheric Equipment

Type "B" Apparatus—Designed for air washing in public buildings and Industrial plants, where the greatest possible cooling effect by evaporation is desired. Webster System of Automatic Humidity Control may be applied to the various types of Webster Air Washers, Humidifiers and Dehumidifiers Perfect in principle and accurate in operation—the chief controlling thermostat subject to water, a medium with four times the specific heat of air.

SERVICE

Our Engineers are available at all times for investigation of conditions and consultation regarding the adaptability of our apparatus

We will not undertake a contract where we cannot accomplish just the results the buyer wishes, but where we do accept an undertaking we will give our best thought and skill to its complete accomplishment.

AUDUBON WIRE CLOTH CO., INC.

Manufacturers of Wire and Wire Cloth for All Industrial Uses

AUDUBON, N. J.

AUDUBON
WIRE PRODUCTS
for Industrial Uses

PRODUCTS

- **Double Crimp Heavy Steel Wire Screen in all metals**
- **Steel or Galvanized Wire Cloth**
- **Copper and Bronze Wire Cloth**
- **Bronze Strainer Cloth**
- **Brass Filter Wire Cloth**
- **Mill, Mine and Quarry Screens**
- **Wire Window Guards, and Partitions**
- **Elevator Enclosures**
- **Skylight, Machine or Radiator Guards, Grills and Railings, Brass or Iron**
- **Baskets, Crates, Trays, Spark Guards**
- **Cages**
- **Special Forms**
- **Foundry Riddles**
- **Desk and Counter Railings**

DOUBLE CRIMPED HEAVY STEEL WIRE SCREEN

For screening in Coal Mines, Quarries, etc From 3/16" to 4" spacing, and from .092" to 1" wire.

STEEL OR GALVANIZED WIRE CLOTH

For general uses where a cloth of better than average strength and wearing quality is desired. From .0053" to .928" spacing, and from .0053" to .307" wire.

TINNED MILLING GRADE SCREEN OR WIRE CLOTH

For general industrial use where a rust resisting screen is required that will cost less than brass, copper or bronze. From .0102 to .446" spacing, and from .0065" to .054" wire.

BRASS, COPPER OR BRONZE WIRE CLOTH

Used extensively for ordinary industrial filtering by either gravity or pressure, and where extra precaution is unnecessary. From .0068" to .935" spacing, and from .0065" to .259" wire

EXTRA FINE MESH BRASS WIRE CLOTH

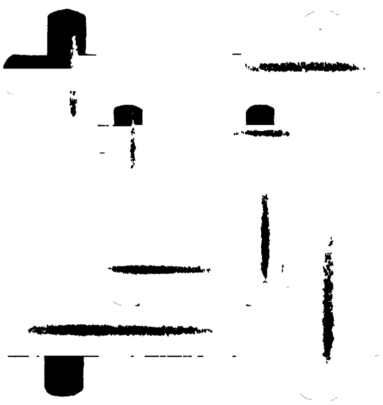
For extra fine screening--made in meshes from 110 to 300 with spacing from .0027" to .0051" and with wire from .0023" to .0045".

BRASS STRAINER CLOTH

For straining milk or any liquid or substance that could be strained through a milk strainer, made in 40, 50 and 60 mesh.

BRASS FILTER WIRE CLOTH

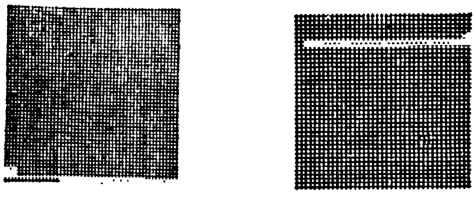
A Dutch woven cloth that is made of brass of tinned brass and is used extensively in all sorts of Centrifugal Straining—especially in sugar mills. Made 10 x 80 mesh, 12 x 120 mesh and 14 x 120 mesh.



DOUBLE CRIMPED HEAVY STEEL WIRE SCREEN

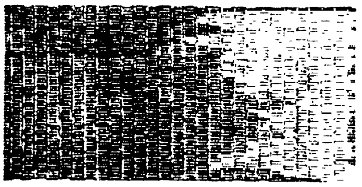
2 Mesh 105 60 Mesh 0085

STEEL GALVANIZED WIRE CLOTH



No 51 No 60

BRASS MILK STRAINER CLOTH



BRASS FILTER WIRE CLOTH

CATALOG

To have a really comprehensive idea of Audubon Products you should have our catalog, of course—a postal will bring it to your desk. In addition to description and illustrations of Audubon Products, it contains also some very useful data, and plain instructions for ordering.

THE AUTOMATIC REFRIGERATING COMPANY

Automatically Controlled Refrigerating and Ice Making Plants

MAIN OFFICE AND WORKS

HARTFORD, CONN.

BRANCH OFFICES

Atlanta, Ga.
Boston, Mass.
Chicago, Ill.
Cleveland, Ohio

Honolulu, T. H.
Huntington, W. Va.
Los Angeles, Calif.
New York, N. Y.
New Orleans, La.

Rochester, N. Y.
Seattle, Wash.
San Francisco, Calif.
Washington, D. C.

AGENCIES

Houston, Texas.

Baltimore, Md.

PRODUCTS

Completely Automatic Ammonia Compression Refrigerating and Ice Making Plants, including Compressors, Condensers, Coils, Piping, and Traps, and Automatic Controlling and Safety Devices for Refrigerating Plants.

ADVANTAGES AND SCOPE OF UTILITY

Chief among the numberless and varied uses of refrigerating and ice making plants are their advantageous application to industrial needs. Automatic refrigerating equipment designed for large industrial establishments is especially adapted to conditions where absolute control of temperatures is necessary, such as calibrating thermometers and instruments, quenching baths for tempering steel and high grade tools, caustic soda dipping tanks for textile mills, paraffin coated paper manufacture, absolute temperature control of chemical process and air conditioning.

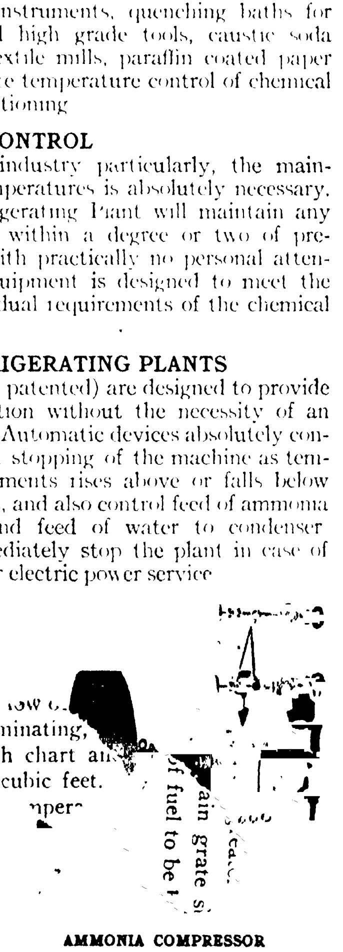
TEMPERATURE CONTROL

In the chemical industry particularly, the maintenance of exact temperatures is absolutely necessary. An Automatic Refrigerating Plant will maintain any desired temperature within a degree or two of predetermined points with practically no personal attention. Automatic equipment is designed to meet the most exacting individual requirements of the chemical industry.

AUTOMATIC REFRIGERATING PLANTS

These plants (fully patented) are designed to provide mechanical refrigeration without the necessity of an operating engineer. Automatic devices absolutely control the starting and stopping of the machine as temperature in compartments rises above or falls below predetermined points, and also control feed of ammonia to expansion coils and feed of water to condenser. Safety devices immediately stop the plant in case of trouble with water or electric power service.

COMPRESSORS



AMMONIA COMPRESSOR

They are of the vertical 2-cylinder, single acting, enclosed type, built to [illegible] accurate dimensions, with parts interchangeable. They are provided with adjustable discharge valves and "safety heads" to prevent damage to cylinder heads from non-gaseous substances getting into cylinders. Pistons are provided with balanced suction valves, assuring full capacity suction stroke. The stuffing box, packed with semi-metallic packing, is made especially long, providing a long bearing and lubricating surface to the crankshaft and reducing to a minimum any chance of ammonia leaks. The compressors are built from ½ ton to 32 tons refrigerating capacity per 24 hours. The construction is particularly rugged and all parts are thoroughly tested.

AUTOMATIC CONTROL

The control equipment is mechanically correct and of rugged construction, therefore thoroughly dependable. It includes a specially designed switchboard, equipped with Automatic safety devices that shut the machine down and cut off all power in the event of trouble in the electric service, preventing danger of damage to motor.

THERMOSTAT

The thermostat, very sensitive to changes in temperature, controls the starting and stopping of the machine so as to maintain any desired temperature within a degree or two of a predetermined point, preventing consumption of power except when the temperature requires it.

AUTOMATIC EXPANSION VALVE

Automatically controls the feed of ammonia to the expansion coils, thus maintaining the most economical pressure for the expansion of the liquid ammonia in the coils. It is easily adjusted and functions perfectly.

AUTOMATIC WATER REGULATOR

Automatically controls the flow of water to the condenser, and automatically adjusts the water use to requirements of the plant. The action of the water valve is powerful and positive and water waste is eliminated.

AUTOMATIC HIGH PRESSURE CUT-OFF

Automatically stops the plant should the head pressure approach the danger point, due to failure of water supply or any other cause. It puts the plant in operation again when the cause of the high pressure is eliminated.

REPAIR PARTS

All parts of Automatic Plants are subjected to rigid test and are interchangeable. A complete stock of repair parts is always carried, making it possible to replace any part with the least possible delay.

CO-OPERATIVE SERVICES

Our engineering department will gladly co-operate with engineers in the solution of special problems affecting mechanical refrigeration. The service, including preparation of drawings and data, is at the disposal of clients and entails no obligation.

THE BABCOCK & WILCOX COMPANY

Manufacturers of Water Tube Boilers, Superheaters and Stokers
85 Liberty Street
NEW YORK, N. Y.

BRANCH OFFICES

Boston, 49 Federal Street
Philadelphia, North American Bldg
Pittsburgh, Farmers Deposit Bank Bldg
Cleveland, Guardian Bldg
Chicago, Marquette Bldg
Cincinnati, Traction Bldg
Detroit, Ford Bldg

Atlanta, Candler Bldg
Tucson, 21 S Stone Avenue
New Orleans, 521 5 Baronne Street
Denver, 435 Seventeenth Street
Salt Lake City, 705 706 Kearns Bldg
Honolulu, H I, Castle and Cooke Bldg
Fort Worth, Flatiron Bldg

San Francisco, Sheldon Bldg.
Los Angeles, 404 406 Central Bldg
Seattle, L. C. Smith Bldg
Havana, Cuba, Calle de Aguiar 104
Houston, Southern Pacific Bldg
San Juan, Porto Rico, Royal Bank Bldg

PRODUCTS

Oil Heaters for supplying hot oil for process work requiring high temperature and close temperature control; Water Tube Boilers of the Babcock & Wilcox, Stirling and Rust types; Steam Superheaters; Chain Grate Stokers; Oil Furnaces for Boilers.

OIL HEATERS

The first Babcock & Wilcox Oil Heater for process work was supplied in 1908. The hot oil was used to permit close temperature regulation. Since then the Babcock & Wilcox Company has furnished oil heaters of various types and for a wide range of operating conditions to chemical industries. Its experience in building such heaters and in installing oil-burning apparatus will be helpful to chemical engineers who are designing process plants where hot oil will be used.

WATER TUBE BOILERS

The Babcock & Wilcox Boiler has been used extensively in the chemical industry where dependability and efficiency are desirable. This boiler is of the horizontal type. The Stirling Boiler, which is of the semi-vertical type, is also widely used in the chemical industry. The Rust Boiler, of the vertical type, has found its main use in the iron and steel industry.

These types are distinct, yet in each the design meets successfully the four main requirements for economical boiler operation, namely, the pressure parts are supported independent of the brickwork, all metal parts are free to expand and contract, all pressure parts are readily accessible for inspection and repair, and the circulation of water and furnace gases is so free that the boilers can be operated at high ratings without serious loss of efficiency.

In the past decade, higher steam pressures and higher superheat have come into every-day practise, and with these changes have come larger units and higher rates of combustion, due to better stokers and furnace arrangement, better feed water treatment, and a better understanding of boiler operation. Great improvements have been made in the utilization of other fuels than coal. These developments necessitate a much more careful study of the size of plant, service conditions, fuel, water and labor. Each prospective boiler installation is regarded as an entirely new and independent engineering problem, the various factors involved determining the particular type, size and setting of boiler recommended.

The boilers are built in accordance with the Boiler Code of The American Society of Mechanical Engineers, and a certificate of shop inspection by the Hartford Steam Boiler Inspection & Insurance Company or other qualified inspection company will be furnished.

STEAM SUPERHEATERS

Steam superheaters were introduced commercially in the United States by this company, and many installations for furnishing superheat for both power and process work have been made in chemical industries. The company builds both integral and separately-fired superheaters and some of the latter type which it has designed are for very high temperatures and pressures.

CHAIN GRATE STOKERS

Automatic stokers enable a boiler to be operated at higher capacity and with greater economy than hand firing permits. The chain grate stoker also enables very inferior grades of fuel to be burned with marked efficiency.

PUBLICATIONS

These cover all products of the company and can be had at any Branch Office.

BAILEY METER COMPANY

2021 East 46th Street
CLEVELAND, OHIO

PRODUCTS

Fluid Meters, Boiler Meters, V-Notch Weir Meters, Special Meters for Chemically Active Fluids and Gases, Recording Instruments. All manufactured under the trade-name "Bailey."

BAILEY FLUID METERS

Bailey Meters are operated by a pressure difference which is produced by the fluid flowing through an orifice placed between a pair of flanges in the pipe line. There are but two moving parts to the meter and they are not subjected to the direct action of the steam, hot gases or other fluid being metered. Meters of special design can be made so that active liquids can not possibly come in contact with these parts. Other meters can be built with the parts of some special material not affected by the liquid or gas to be metered.

The orifice serves the same purpose as a Venturi tube, but is much easier to install and is more accurate for measuring steam, water, air or gases. In special cases the orifice may be constructed of steel, brass, aluminum, glass, hard rubber, or other special material. The pressure loss is too small to be noticed. There is no change in the orifice due to wear or scale.

The capacity of the meter is readily changed by exchanging orifices. The meter can be used for portable work or permanently piped to two or more orifices in different pipe lines and switched from one to another by merely changing valves.

FLUID METER, TYPE C2

Records Rate of Flow of steam, water, air or gas on the outer 2¼-inch section of a 12-inch chart; integrates total flow; and can be equipped to record pressure or temperature on the inner 2-inch section of the same chart. Net pressure drop one-half pound.

TYPE C2
FLUID METER

GAS METER, TYPE C10

Records Rate of Flow of low-pressure gas (by-product coke-oven, illuminating, etc.) with 4¼-inch pen motion on a 12-inch chart and integrates total flow reading directly in cubic feet. It can be equipped to record pressure or temperature. Net pressure drop ½ inch water pressure.

BAILEY BOILER METER

This meter records Steam Flow, Air Flow and Flue Gas Temperature all on the same chart. It may also be provided with Fire-Box Draft Indicator, Wind-Box Pressure Recorder, Steam Flow Integrator or other useful supplemental records or indicated results essential to the operation of the furnace or stoker.

The most important feature of this meter lies in the ratio between the Steam Flow and Air Flow. Air is a fuel just as much as coal and a certain evaporation per pound of air should be obtained. When this condition exists the two pens and records show the same reading. When there is an excess of air, the Air Flow reading is greater than the Steam Flow. A deficiency of air, resulting in loss due to unburned gases, is shown by the Air Flow reading being less than the Steam Flow.

The Flue Gas Temperature record on the same chart is a positive check against dirty tubes and leaky baffles.

BAILEY WEIR METER

Records Flow of Water or other liquid through V-notch or rectangular weirs on uniformly graduated chart without the use of cams or other complicated mechanism. The meter is equipped with integrator reading directly in pounds or gallons. For feed-water, hot well discharge, etc., at or near atmospheric pressure. May be made of special materials to withstand various liquids.

OTHER TYPES

Many other types of recording meters for special purposes such as Specific Gravity of liquids or gases, Relation between the Flow of two fluids or gases, Differential Pressure Recorders accurate to 1-1000 inch water pressure. We can build special meters for any liquid or gas.

SOME USERS

American Cyanamid Co ,	New York, N. Y.
American Hard Rubber Co ,	Akron, Ohio.
American Steel & Wire Co	Cleveland, Ohio.
American Sugar Refining Co ,	New York, N. Y.
Barber Asphalt Paving Co ,	Maurer, N. J
Belgo-Canadian Pulp & Paper Co ,	Shawinigan Falls, P. Q.
Bethlehem Steel Co ,	Bethlehem, Pa
Cambria Steel Co ,	Johnstown, Pa.
Champion Fibre Co ,	Canton, N C.
Denver Gas & Electric Light Co ,	Denver, Colo
Duquesne Light Co ,	Pittsburgh Pa.
Federal Rubber Co ,	Cudahy, Wis.
Fiberloid Corporation, The,	Indian Orchard, Mass.
Firestone Tire & Rubber Co ,	Akron, Ohio
B F Goodrich Co ,	Akron, Ohio
Goodyear Tire & Rubber Co ,	Akron, Ohio.
Hood Rubber Co ,	Watertown, Mass.
Inspiration Consolidated Copper Co.,	New York, N. Y.
Laurentide Company, Ltd ,	Grand Mere, P. Q.
Merrimac Chemical Co ,	Boston, Mass
National Fibre & Insulation Co ,	Yorklyn, Del
Pierce Oil Corporation,	New York, N. Y.
Solvay Process Co ,	Syracuse, N. Y.
Tennessee Coal, Iron & Railway Co.,	Birmingham, Ala
U.S Bureau of Mines,	Pittsburgh, Pa.
U. S. Ordnance Dept ,	Washington, D. C.

THE BABCOCK & WILCOX COMPANY

Manufacturers of Water Tube Boilers, Superheaters and Stokers

85 Liberty Street

NEW YORK, N. Y.

BRANCH OFFICES

Boston, 40 Federal Street
Philadelphia, North American Bldg
Pittsburgh, Farmers Deposit Bank Bldg
Cleveland, Guardian Bldg
Chicago, Marquette Bldg
Cincinnati, Traction Bldg
Detroit, Ford Bldg

Atlanta, Candler Bldg
Tucson, 21 S Stone Avenue
New Orleans, 521 5 Baronne Street
Denver, 435 Seventeenth Street
Salt Lake City, 705 706 Kearns Bldg
Honolulu, H I, Castle and Cooke Bldg
Fort Worth, Flatiron Bldg

San Francisco, Sheldon Bldg.
Los Angeles, 404 406 Central Bldg
Seattle, L. C. Smith Bldg
Havana, Cuba, Calle de Aguiar 104
Houston, Southern Pacific Bldg
San Juan, Porto Rico, Royal Bank Bldg

PRODUCTS

Oil Heaters for supplying hot oil for process work requiring high temperature and close temperature control; Water Tube Boilers of the Babcock & Wilcox, Stirling and Rust types; Steam Superheaters; Chain Grate Stokers; Oil Furnaces for Boilers.

OIL HEATERS

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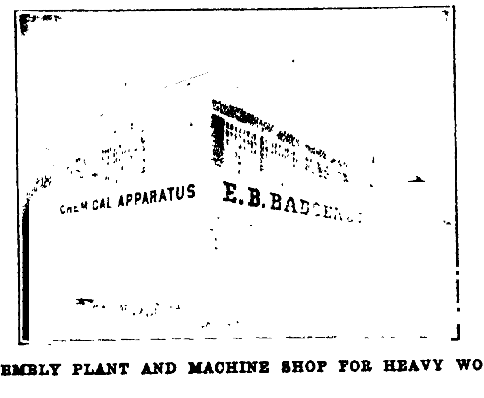
BADGER ENGINEERS SUPERVISE EVERY STAGE OF THE CONSTRUCTION OF A COMPLETE PLANT

therefore, been developing this **Badger Service**, and as a result have been in a position to demonstrate the truth of our assertions many times during the great chemical developments in this country resulting from the war.

Many plants have been comparative failures because the owners did not realize that a consulting engineer is often lacking in construction knowledge and that metal workers are lacking in the necessary knowledge of chemical engineering, and above all, that research is a fundamental requirement in the development of any industry.

Through research and laboratory work we are able to develop chemical processes, to determine the proper general design of equipment, and the best materials to use in construction; through our engineering organization, in conjunction with shop, we are able to coordinate the results of experimental work and to determine on the proper design and construction of apparatus; through our shop and business organization we are able to make prompt and reliable shipment of equipment and to handle properly the details involved in construction of complete plants, and in conjunction with laboratories provide facilities for quick completion of experimental equipment; and finally through our engineering organization again, we are in a position to supervise the design of complete plants and to render invaluable service required in connection with the development of all new industries, in erection and operation of plant, advice as to purchase of materials, and disposal of products, etc.

On the following pages we describe certain equipment which we furnish. It is impossible, of course, to go into specific details, or to cover all of our apparatus. We can give detailed information on any of our products on request.



ASSEMBLY PLANT AND MACHINE SHOP FOR HEAVY WORK

SHOP ORGANIZATION

We have previously mentioned the great importance of proper manufacturing organization to make possible prompt shipments.

We have organized an employment department to handle the labor question, and expect shortly to start a trade school to train men in the different branches of our work, since there are not sufficient trained mechanics available in the United States today for our class of work.

We have an organization entirely concerned with the handling of raw materials, following orders and shipments, handling shipments of material from our plant, etc. During the war when practically every industry was handicapped through failure to deliver machinery on time, we were able substantially to live up to our schedules and were highly commended for our work in this line by the Government.

OUR WORK DURING RECENT YEARS

The extent and quality of our service and equipment cannot be better illustrated than by specific reference to the large variety of work undertaken and built by us during the period of the Great War. While a great deal of this work was of nature such that it will not be duplicated in the future, yet the service and equipment supplied is similar to that necessitated by present day work. Our work at the present time involves as large, if not as great, a variety of machinery and effort.

The present period of reconstruction is presenting equally interesting problems to us for solution as those which we overcame in the days of the War. At no time has it been more necessary than at the present to introduce every possible economy in production, and to recover every valuable by-product.

The necessity for producing in large quantities such products as ammonia, alcohol, acetone, ether, acetate of lime, smokeless powder, benzol, toluol, caustic soda, etc., and of getting these materials out in the shortest possible time, and in the most economical manner, required the services of an experienced and efficient organization, and the volume of work which we undertook and completed without, in a single case, holding up the output of the plant where machinery was installed, is a sufficient testimony as to our ability.

The production of smokeless powder alone required the manufacture in various plants of the United States and Canada of around 2,500,000 lbs. of ether per day, and the recovery of an approximately equivalent amount of ethyl alcohol.

Approximately 95 per cent. of all of the distilling equipment used for this work in the United States and

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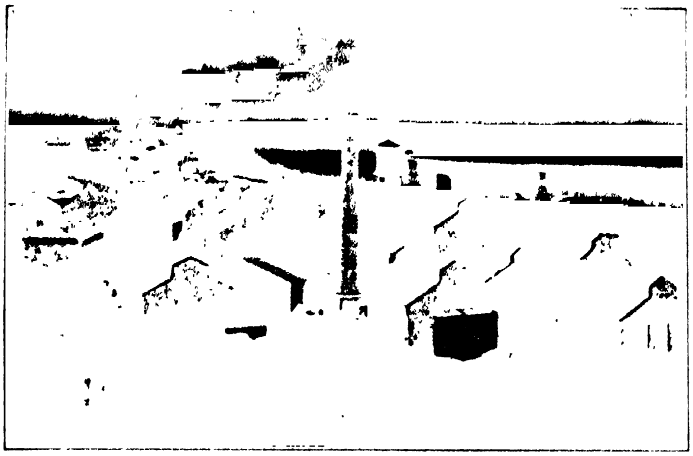


CANADIAN ELECTRO PRODUCTS CO'S PLANT, SHAWINIGAN FALLS, P. Q.

Canada was furnished by us, and we have received the highest testimonials as to the quality of the workmanship, speed in delivery and erection, and efficiency of equipment in question.

In the case of the United States Government Explosives Plant at Nitro, West Virginia, having a capacity of 625,000 lbs. of smokeless powder per day we equipped six complete ether-alcohol plants, furnishing the design of plants, and constructing, installing and operating all of the machinery.

The production of ammonia is a very important matter. We designed and installed very large equipment for the production of pure anhydrous ammonia from crude aqua ammonia, also installed all of the distilling machinery of special design and construction required in the production of ammonia gas.

The shortage of acetone for the manufacture of cordite was a very serious factor at the beginning of the war. Practically the only source of production of this material in 1914 was acetate of lime. The enormous demand necessitated not only the erection and enlargement of wood distillation plants, in order to increase the supply of acetate, but also the erection of acetone plants for producing acetone from acetate. It was furthermore necessary to develop various other sources of production of this material, and in this work we were very active.

One of the largest plants in the world producing acetic acid and acetone—that of the Canadian Electro-Products Company at Shawinigan Falls, Quebec, Canada—is equipped throughout with distilling machinery and other equipment of our design and manufacture. We not only constructed the larger part of the experimental equipment for developing the process employed for the production of acetic acid from acetylene, but assisted in the design and arrangement of plant and furnished the larger part of the very special and complicated machinery necessary.

The success of this plant is a sufficient testimonial to the ability of all concerned, and the successful operation of the equipment supplied by us was a vital factor.

Another product which was, as every one knows, of greatest important was toluol, used in the production of trinitrotoluol, and its homologue, benzol, used in the production of phenol and picric acid.

We designed and installed a considerable amount of the first equipment erected after the beginning of the war for the recovery and refining of these products, and equipped complete two of the earliest and largest refineries turning out these materials.

We designed forms of refining stills which were an improvement on anything used before in this country for such work, and which permitted the production of the very highest grade of products such as were essential to the manufacture of the purest, stable and uniform explosives.

The production of the highest grade of phenol for the manufacture of picric acid was of first importance, and during the years of the war we supplied the largest concerns in the United States, manufacturing this material, with our special design of phenol refining stills, which permitted the production of a higher grade of product than had been before commercially manufactured in this country.

The wood distillation industry yielded acetate of lime produced in the production of acetone and acetic acid, and methyl alcohol used in the manufacture of methyl acetate, all of these products being used in the production of airplane dopes and solvents for such dopes.

We not only furnished a large amount of equipment to many of the wood distillation plants, but designed and equipped substantially complete three of the largest refining plants for wood distillation products in the United States.

The recovery of solvent used in the manufacture of smokeless powder is another important line of work. We designed and installed a large amount of equipment of new and special design which operated with great satisfaction, and effected a greater economy in the recovery of exceedingly scarce and valuable materials.

We have only mentioned above a few of the general propositions in which we had a particular hand. We were designing and manufacturing, however, at the same time hundreds, in fact, thousands of pieces of standard and special equipment for hundreds of the various concerns engaged in war work. Let us emphasize again, however, the fact that we describe this work, not for the mere purpose of enumerating our services, but to make plain the fact that under the extreme stress of war requirements we were chosen to do by far the larger part of work in our lines, and we were able to carry it out successfully on account of our efficient organization and extended experience. The same requirement for such experience and organization exists at the present time; in fact, under the more nearly competitive conditions prevailing, efficient machinery is, if anything, of greater importance.

COMPLETE PLANTS

We are in a position to furnish complete installations as well as special apparatus and machines for manufacturing, producing or extracting:

Acetic Acid
Acetone
Amyl Acetate
Dyewood Extracts
Tanning Extracts
Ethyl Ether
Fatty Acids
Glycerine
Phenol
Salicylic Acid
Methyl Alcohol, etc.

as well as a large variety of other products.

Continued on Next Page

INDUSTRIAL ALCOHOL PLANTS

The production of industrial alcohol is destined to be a more and more important factor in the future. It is recognized that alcohol has advantages over gasolene and other hydrocarbons for use in internal combustion engines, and the increasing scarcity of gasolene will involve the more extended use of alcohol, and products containing alcohol, as time goes on. Moreover, there are a vast number of other important industrial uses for alcohol

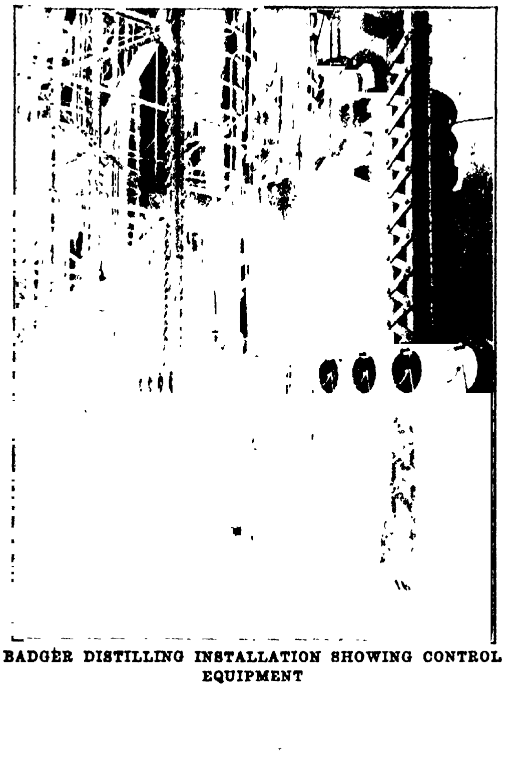
For years we were the sole representatives in the United States of Messrs E Barbet et Fils et Cie of Paris, France, the largest builders of complete alcohol plants in the world They have installed plants for the production of alcohol from molasses, grain, potatoes and substantially every raw material commercially employed, in some thirty different countries of the globe.

We are in a position to design and install complete plants, embodying all of the latest improvements, such as pure yeast culture apparatus, continuous refining stills, centralized control, molasses sterilization equipment, etc.

Not only are we prepared to design, erect and place in operation new industrial alcohol plants, but we can also undertake to modernize already existing plants of this kind, and to modify beverage alcohol plants so as to make them suitable for the production of non-beverage alcohol.

Continuous Stills—Continuous refining stills offer many advantages as compared with discontinuous stills, and we regret to say that the increase in efficiency and the great economy to be effected by the use of this type of equipment have not yet been fully appreciated in this country

The continuous still, as the name implies, is continuous in its operation, requiring a constant feed of material to be distilled, a constant pressure of steam and a constant feed of water. As the feed of material to be distilled is regular and continuous, the concentration of the volatile liquid (alcohol) is therefore constant at any point in the system hence the impurities can be collected and withdrawn at certain points on the still; and high grade alcohol at another place



BADGER DISTILLING INSTALLATION SHOWING CONTROL EQUIPMENT

The following are principal advantages of Continuous Distillation

Continuous stills require less than one-half the steam required by a discontinuous installation of the same capacity, consequently a smaller boiler plant is needed

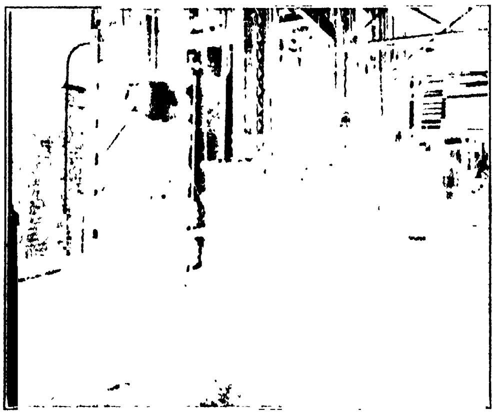
Continuous stills do not require as much room as discontinuous stills of the same capacity

The continuous still requires less water for condensing than the discontinuous still

Continuous stills are simpler to operate than discontinuous stills

The products of a continuous still are much more uniform than from a discontinuous still

Although a continuous still costs slightly more than a discontinuous still, it lowers the cost of operation and permits of a very considerable constant saving.



DISTILLING EQUIPMENT

Alcohol from Waste Sulphite Liquor.—We have developed a process for the production of alcohol from waste sulphite liquor, formerly a by-product of the manufacture of sulphite pulp, and are in a position to furnish complete plants for carrying out this process. The gradual increasing agitation against the pollution of streams with such waste products will necessitate their utilization and disposal. Processes which we have developed will permit such disposal at a profit, instead of a loss.

Dealcoholization—The Constitutional Amendment prohibiting the manufacture, sale and transportation of intoxicating beverages, has necessitated the production of a large variety of substantially alcohol-free products, and many concerns find it necessary to manufacture a product containing alcohol, and remove the alcohol therefrom. Many brewers and wine manufacturers are manufacturing products as before and dealcoholizing such product later.

We have developed, after thorough experimentation, a very ingenious plant for dealcoholizing work.

We also manufacture a very efficient type of rectifying still for refining the alcohol so obtained.

For complete information on Badger Dealcoholizing Plants see page 325.

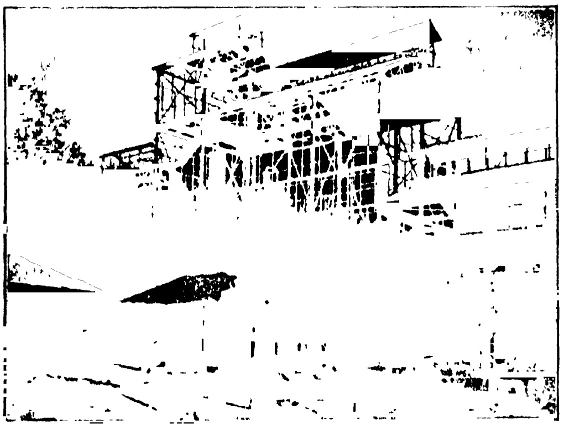
Continued on Next Page

WOOD DISTILLATION PLANTS

We are the only concern in the United States in a position to equip and operate complete plants for the distillation of hard and soft woods, employing the most advanced types of equipment throughout. We build a large part of the equipment in our own shops, and have a force of technical experts to supervise the installation and operation. This staff includes technical engineers, two of whom have been for extended periods operating superintendents of the largest plants in the United States.

Our standard equipment includes the following:

Retort Ovens
Badger Retort Cars
Wood Predryers
Charcoal Coolers
Retort Condensers
Badger-Webre Single and Multiple Effect Evaporators
Tar Stills
Badger Continuous Limelee Stills
Badger Concentrating Stills
Complete Methyl Alcohol Refining Stills
Filter Presses
Mixing Tubs
Acetate Dryers
Pumps, Engines, Piping, etc., complete



WOOD DISTILLATION PLANT UNDER CONSTRUCTION

In practically every case this equipment represents great improvement over types formerly in use.

The wood distillation plants in this country formerly produced crude wood alcohol for sale to refiners, who controlled the markets and prices, and obtained most of the profit. It was not feasible for crude wood distillation plants to refine their product with the old style machinery. We introduced and perfected the **Badger** Continuous Refining Stills of various types and made it possible for the crude plants to manufacture, at no greater operating expense than was formerly required in the production of crude alcohol, any grade of refined product from 95% to 99.8% pure methyl alcohol containing as low as 2/100 of 1% acetone.

The production of acetic acid and acetone from acetate of lime is frequently carried out in conjunction with the refining operations. We are in a position to furnish the most up-to-date plants and refining equipment for manufacturing these products.

The wood distillation industry has utilized almost exclusively up to the present logwood and slabs, as processes for the handling of fine wood, such as sawdust and chips, and other finely divided cellulose products, such as cottonseed hulls, cocoanut shells, crushed corncobs, etc., were not available. The necessity for conservation of resources has required the development of processes for the handling of such material, and we have been concerned with the development of various processes for this work.

Realizing the above we have been conducting complete and extensive experiments for three years, which have resulted in the practical perfection of a new, ingenious and patented process, permitting the handling in a much more economical manner than at present of finely divided cellulose products, which we feel will unquestionably revolutionize the wood distillation industry.

We refer to the **Stafford Process.**

This process was developed by Professor Stafford of the University of Oregon, from small scale experiments and has been thoroughly worked out by us on small plant scale.

The results have been such that we are now making an initial commercial installation for one of the largest concerns in the United States.

The principle of the Stafford Process makes use of the hitherto known, but not commercially utilized, heat of exothermic reaction of cellulose when at the carbonizing temperature. By predrying and preheating the material, and introducing it into a retort in which material already undergoing carbonization is present, the exothermic heat is sufficient under properly maintained conditions to bring the additional material up to the carbonizing point, when this material in turn will be carbonized and liberate heat, which will serve to bring further material to the carbonizing temperature.

All previous processes for handling finely divided material have endeavored to design a form of retort heated from the exterior, in which the material handled is agitated or heated in a thin film in such a way that the finely divided material will not insulate itself. These retorts therefore have involved mechanical features which have never been satisfactorily worked out, and have furthermore involved in most cases an overheating of the walls, tending to decomposition of the products, etc.

The Stafford Process requires no heating of the retort; in fact, the retort is thoroughly lagged to prevent escape of heat. The material is previously dried in contact with the air, and is introduced continuously into the retort from which the charcoal is also continuously removed.

The advantages of the process are numerous. We would enumerate a few of them as follows:

Cost of Raw Material

Whereas substantially all of the wood distillation plants in the United States use cord wood, costing from $6 to $10 per

Continued on Next Page

cord, for distillation purposes, the Stafford Process can utilize substantially any finely divided material, often waste product, the cost of which may be in some cases not more than 50c for the equivalent of a cord. The saving in this way may be very large.

Saving in Fuel

The heat of decomposition of the wood accomplishing the larger part of the work, the fuel consumption of a Stafford Retort System is very much less than that of an ordinary retort system, and the saving in this respect very considerable. The wood, furthermore, being previously dried, the volume of pyroligneous acid obtained is very much less than when using ordinary air dried log wood, and since in the refining process, this water must be evaporated approximately three times, the economy in steam consumption in the refining process is very much decreased.

Labor Economy

The process being continuous and substantially automatic, the labor requirement for the retorts is only a fraction of that necessary in the standard process. No men are required to load, transport and unload cars and retorts, etc.

First Cost

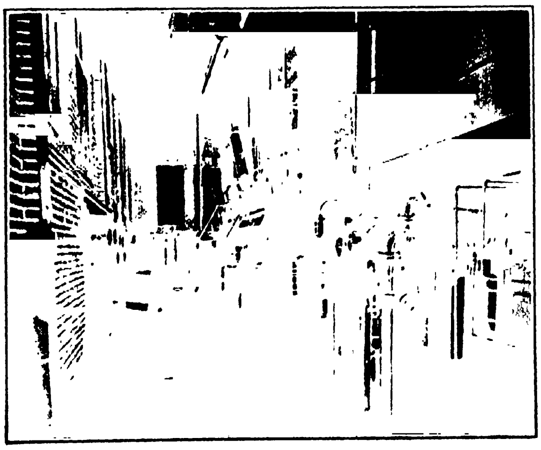
The first cost of the Stafford Process is very materially less than that of the standard retort system, and the interest and depreciation charges are therefore less. Furthermore, retorts not requiring severe heating on the exterior will probably have a very much more extended life.

There are also many other minor economies, such as water consumption, etc. It is very probable that with continuous operating retorts methods of handling the vapor can be devised which will involve great economies as compared with the present system. For instance, it will undoubtedly be possible to utilize continuous tar separating process, and make unnecessary the present process of redistillation of the pyroligneous acid to free it from tar. This will mean a very considerable economy in first cost of plant, as well as in steam consumption and labor.

The Stafford Process is applicable to handling materials other than cellulose products, and will undoubtedly find a very large application.

BENZOL AND TOLUOL PLANTS

Our special equipment for the above work includes **Badger** type scrubbers, **Badger** vacuum wash oil stills, **Badger** refining stills, **Badger** chemical agitators, **Badger** direct-contact oil coolers, etc. All of these types of machinery have been developed through our extended experience in other lines of distillation work.



VIEW IN BENZOL AND TOLUOL REFINING PLANT

STILLS
GENERAL

We manufacture Stills for practically every commercial volatile product. These stills, according to the material handled, are of different types, such as: Continuous, Discontinuous, Pressure and Vacuum, etc., and are constructed of copper, cast iron, steel, aluminum, etc., according to the chemical action.

Our main object is to furnish the most efficient still possible for the purpose, and to give an apparatus which can be easily operated, which will be durable and give the highest grade of product possible.

MATERIALS HANDLED

We have furnished during the past few years installations handling more than 30 different products, such as Benzol, Acetone, Phenol, Ammonia, Aniline Oil, Ether, Carbon, Tetrachloride, Chlorbenzol, Chlorethane, Sulphur Chloride, Methyl Alcohol, Acetic Acid, Ethyl Alcohol, Acetaldehyde, Fusel Oil, Toluol, Amyl Acetate, Salicylic Acid, Ethyl Nitrite, etc.

If the material is handled commercially, we can surely furnish apparatus for distilling; if not, we will undertake to design special apparatus.

EXPERIENCE

We have had experience in the building of distilling apparatus for more than 60 years, when the first simple forms of apparatus were installed in the United States.

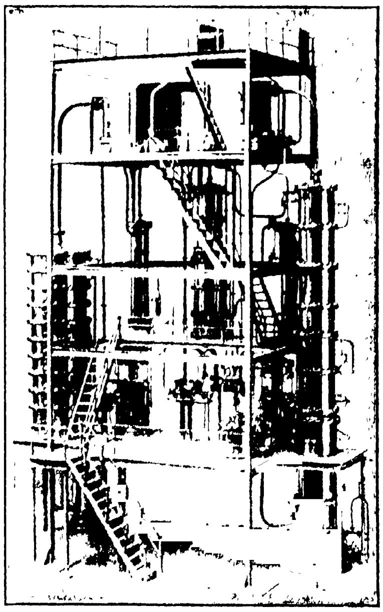
We have perfected in this country the highest type of refining stills, including continuous stills which will eventually replace in substantially every plant of considerable size the obsolete types of discontinuous equipment.

We were the first to install practical continuous stills in this country, and for years we represented the concern of E. Barbet et Fils et Cie, Paris, who were at that time the largest builders of distilling machinery in the world, and the first practical builders of continuous stills.

IMPORTANCE OF PROPER MACHINERY

There are few industries where problems involving distillation do not arise. We are safe in saying that more mistakes are made in the installation of improper apparatus of this type than in any other line of Chemical Equipment.

Usually Stills are employed in the final refining of a manufactured



BADGER-BARBET DISTILLING EQUIPMENT

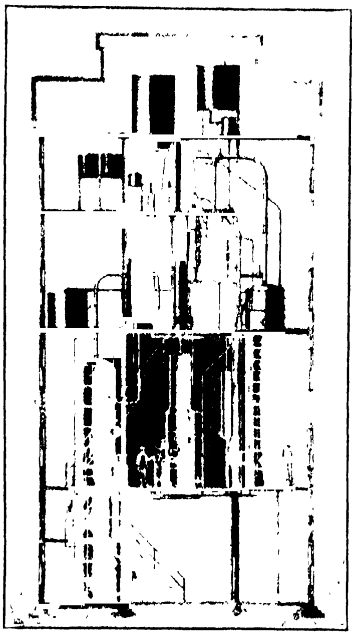
Continued on Next Page

STILLS—Continued

product, and the standard of quality is dependent upon the type of Still employed.

We have known of many plants possessing very costly machinery for the production of a crude material, who put out a low grade product simply because they have economized in the purchase of Distilling Apparatus, which is often a small item in the total equipment.

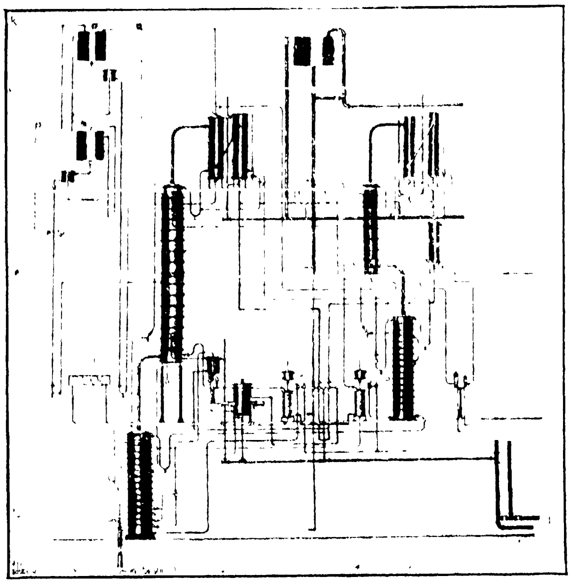
We will not make this statement general, but refer to specific cases where low grades of products such as Benzol, Acetone, Methyl Alcohol, Phenol, Aniline, Turpentine, Ethyl Alcohol, Toluol, Chlorbenzol, were put on the market, and the reputation of the concerns in question were jeopardized, merely on account of the type of Distilling Apparatus which they employed. It is, of course, not always a question of expense, for the better apparatus may be the cheaper.


CONTINUOUS INDUSTRIAL ALCOHOL REFINING STILL

CONTINUOUS STILLS

We have referred to Stills of two general types—Continuous and Discontinuous

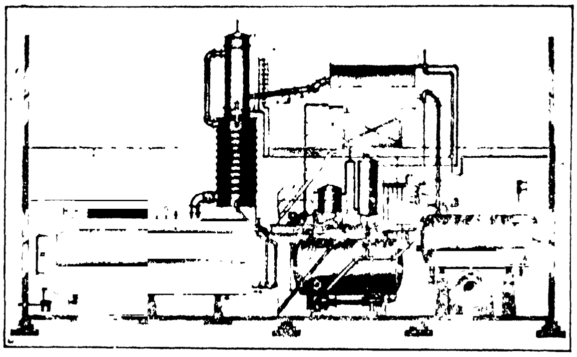
Continuous Stills can be employed to solve almost any Distilling problem with, in most cases, enormous savings. They have revolutionized the distillation of Ethyl and Methyl Alcohol throughout the world.


CONTINUOUS INDUSTRIAL ALCOHOL REFINING STILL

STILLS—Continued

While these Stills are new to the United States, their advantages are rapidly being recognized, as the hitherto wasteful Chemical Industry appreciates their economy. Their advantages where they can be employed lie in economy in steam and water, less loss in distillation, more uniform grades of product, less labor in handling, often lower first cost, and finally, higher grades of product.

As stated above, continuous stills can be employed to handle almost any material, but have an especial advantage in handling such products as Ethyl Alcohol, Methyl Alcohol, Ammonia, Acetone, Ether, Acetaldehyde, Acetone


PHENOL OR ANILINE OIL REFINING STILL

DISCONTINUOUS STILLS

Discontinuous Stills are more applicable to the handling of some products than Continuous Stills.

We have developed many types of Discontinuous Apparatus, each of which comprises particular features peculiar to the **Badger** systems.

We have made many installations during the past year, which have been of vital importance to the success of the plant in question. It is a relatively simple matter to construct a Still which will handle a product such as Alcohol, but the construction of a Unit to handle even this product efficiently, or to handle such products as Phenol, Chlorine products, Acetic Acid, Salicylic Acid, Ether, Benzol, Fatty Acids, is an entirely different matter. Some of our special designs are handling the following materials: Benzol, Toluol, Chlorbenzol, Phenol, Aniline Oil, Salicylic Acid, Acetic Acid, Chloroform, etc.

SPECIAL PROBLEMS IN STILL CONSTRUCTION

While continuous stills and discontinuous stills of standard form can be applied to much work, it is practically always necessary to design special equipment. In many cases we have rendered exceptional service in this direction. Some of the problems which we have successfully solved are the following:

ETHYL ALCOHOL

The distillation of Ethyl Alcohol in the United States was, up to recently, accomplished with a combination of so-called "Beer" Still and Discontinuous Recti-

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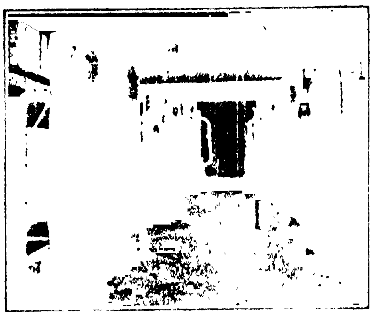
STILLS—Continued

METHYL ALCOHOL AND ACETONE REFINING PLANT

Cleveland Cliffs Iron Company,
Marquette, Mich.

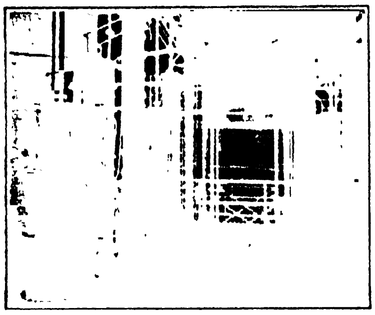


TOP FLOOR

TOP FLOOR

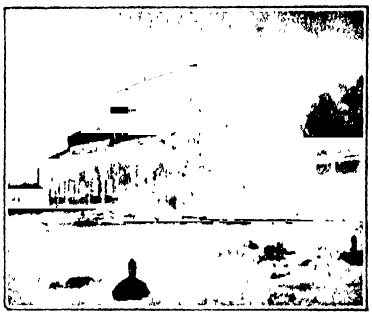
Showing condensers, feed tanks, etc

THIRD FLOOR

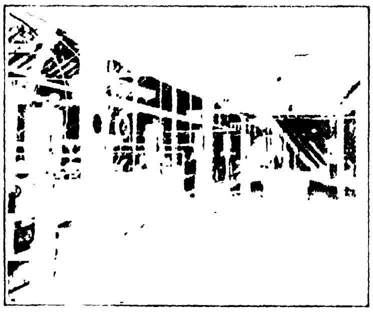


THIRD FLOOR

Rectifying columns

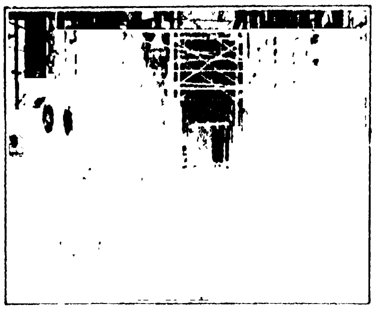


EXTERIOR VIEW



SECOND FLOOR

Showing gages, testers, regulators, etc

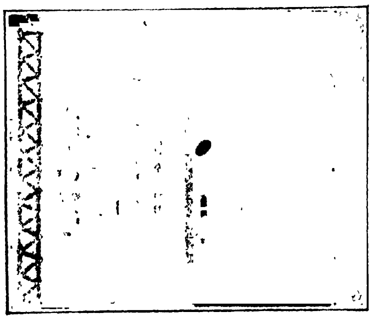


SECOND FLOOR

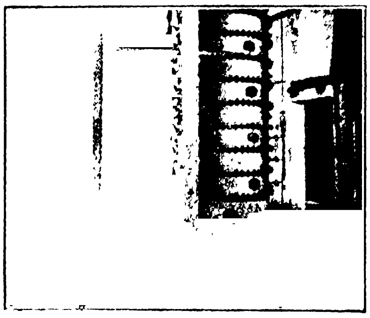
Showing gages, testers, regulators, also purifying columns

SECOND FLOOR

Receiving tanks

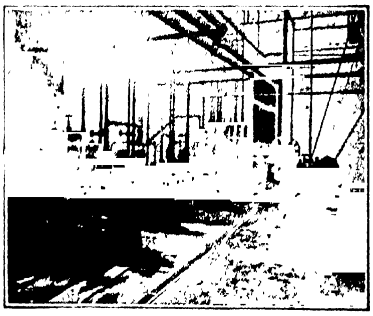


GROUND FLOOR



GROUND FLOOR

Exhausting columns



GROUND FLOOR

Pump room

Continued on Next Page

STILLS—Continued

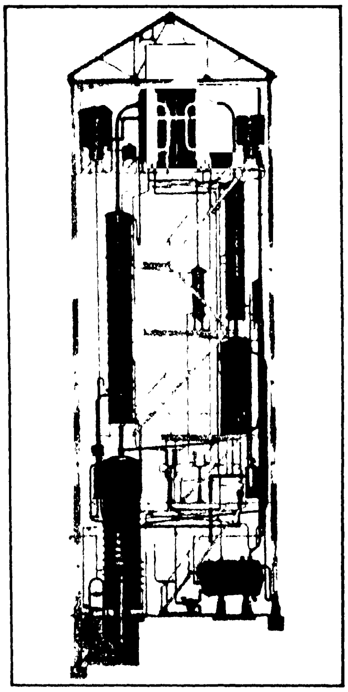
fying Still This necessitated producing first a Crude Product and then refining same with a great deal of handling of Crude and intermediate products

Continuous Stills now perfected, and installed by us, will produce the highest grade of refined alcohol exceeding that produced in any ordinary plant, with less than one-half the fuel expense of the old system, with a much lower loss of product, less labor, less danger from fire loss, and with the possibility of producing a refined product within a few hours after starting operation, as compared with 3 to 4 days under the old system.

METHYL ALCOHOL

The production of refined Methyl Alcohol was, up to within a few years, reserved for large producers of Crude, or for central refineries obtaining crude from many plants. This was due to the fact that the system of Discontinuous refining employed could not be operated practicably on a small scale, and the initial cost of plant for small installations was out of all proportion to the returns.

We have developed and installed refining stills of our multiple column continuous type, producing 99.8% pure methyl alcohol direct from crude product, this methyl alcohol containing less than 2/100 of 1% acetone


CONTINUOUS METHYL ALCOHOL OR ACETONE REFINING STILL

We have recently equipped complete a large refinery, photographs of which we show on page 317. This refinery contains two of our methyl alcohol refining stills of the type referred to above, also complete continuous acetone refining still, producing the highest grade refined product in one distillation from the crude.

ACETONE

The refining of Acetone compares closely with the refining of Methyl Alcohol, and the same types of equipment are applicable. The production of the grade of Acetone required for smokeless powder work necessitates the use of Continuous Stills, or very high costs of operation and loss of product with the Discontinuous system.

We have constructed during the past 2 years Units with an aggregate capacity of practically 12,000 gallons per day refined Acetone, meeting all British Admiralty tests and operating with great economy.

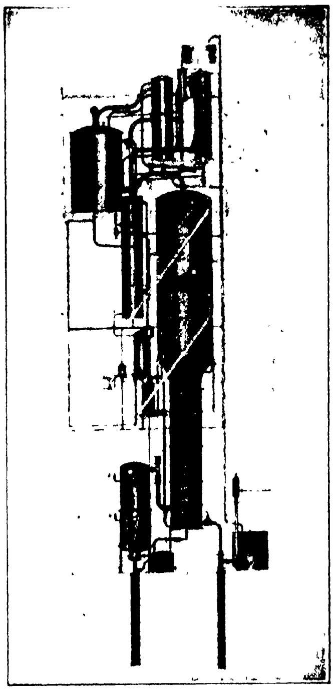
We have installed acetone stills for the refining of this product as produced from acetate of lime, also by direct contact from acetic acid, by fermentation from corn, and installations for its recovery where used as solvent.

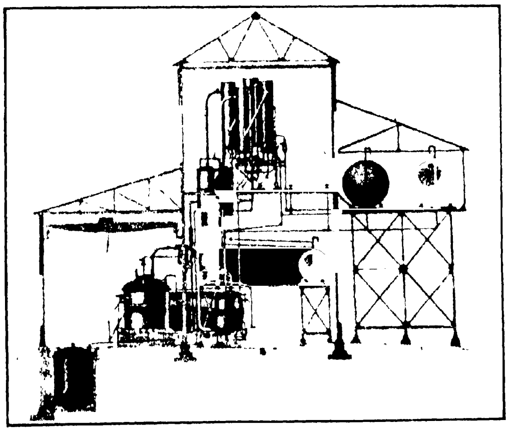
ETHER

We are Constructors of probably 95% of the Ether Stills required for smokeless powder work in the United States and Canada

A total capacity of these Units is in excess of 2,000,000 pounds per day We have developed special types of Stills for this work and the number of installations testifies to their operation

We installed during 1918 complete plants for the manufacture of ether and the rectification of alcohol for several large powder plants, where we have not only furnished the stills, but designed the entire plant, and superintended the installation and operation


CONTINUOUS INDUSTRIAL ALCOHOL STILL


CROSS SECTION ETHER PRODUCTION PLANT

AMMONIA

The use of pure anhydrous ammonia for dye work, also the increasing appreciation of the fact that the purity of the anhydrous ammonia employed in refrigerating machines has a very considerable effect on the efficiency, have created a big demand for such product.

Furthermore the development of processes for the oxidation of pure ammonia to nitric acid makes it probable that such a commercial industry will be developed some time in the future.

Our type of refining stills have great advantages so far as economy in operation is concerned over other

Continued on Next Page

STILLS—Continued

types employed, and since cost is an extremely important factor, our type of equipment must be preferred.

CHLORBENZOL

The production of a relatively pure grade of chlorbenzol from crude is a problem requiring careful design on account of corrosion and other factors. We have designed special units for this work, which are in careful operation, and are even now introducing improvements which promise to give even better results. Large manufacturers of this product, employing our stills, find themselves in a far better position to meet competition and to operate without shutdowns.

BENZOL

We have developed special Units for Benzol and Toluol work, of cast iron construction with automatic flow and pressure regulation which are particularly adapted to the handling of a mixture of volatile products, each of which must be obtained in a pure form.

Our Benzol Stills differ materially in type from Units for handling other materials. We have in operation more than 60 Benzol Stills

PHENOL

Any cast iron Still will produce Phenol, but safety, economy, and above all, quality, require carefully designed apparatus.

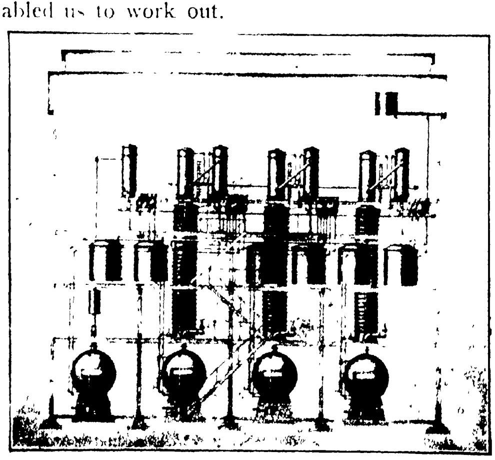
We have installations in operation which have an aggregate capacity of more than 190,000 pounds of pure Phenol per day.

These Stills have very special features and Plants equipped with our apparatus have set a standard of quality in this material. A poor Still means a poor product, no matter how expensive the rest of the plant may be.

One large manufacturer producting an exceedingly high grade of phenol purchased one of our stills of large size, later another unit, and more recently two more units at different times. This manufacturer has a national reputation on account of the quality of his product.

SALICYLIC ACID

The special design of Still with special lining required for handling this valuable product is right in our line. Equipment which we have furnished and have in successful operation, involves features which only long experience in design and construction has enabled us to work out.



BENZOL OR CHLORBENZOL REFINING STILLS

STILLS—Continued

ACETIC ACID

The construction of Acetic Acid Stills requires not only special knowledge of design, but expert knowledge of heavy copper and aluminum construction.

We construct complete Stills in our own shop, and have had many years' experience in this line. Our Apparatus has improvements over the German types formerly imported by manufacturers of this product.

ANILINE OIL

We construct Aniline Oil Stills of types similar to our Phenol Stills which produce grades of product far better than those manufactured by plants of the old style of equipment. A good still is essential to this work, but many concerns do not yet realize it.

The recovery of aniline from dilute water solutions in plants manufacturing this product is an operation for which our continuous stills are used to great advantage. Various concerns throw away such solutions, under the impression that the aniline cannot be economically recovered. We are prepared to guarantee the operation of our equipment; it will pay big dividends

SPECIAL PROBLEMS

The above refer to more or less standard products, but there are always special problems, such as the refining of ethyl and amyl acetate, fusel oil, ethyl nitrite, etc., problems connected with the recovery of alcohol in solutions of different concentration, of mixtures of such products as acetone and alcohol; mixtures of acetone and butyl alcohol, of benzol and alcohol, etc. The experience required to permit such design and gained in the operation of such equipment should be invaluable to the prospective still purchasers.

DISTILLING UNDER VACUUM AND UNDER PRESSURE

The outlines above have referred principally to standard distilling equipment operating under atmospheric pressure, although some of the units, such as those for phenol, aniline oil, etc, operate under a vacuum. This brings up another feature of distilling work not generally appreciated; that is, the advantages at times of operating under Pressure or Vacuum.

DISTILLING UNDER VACUUM

Operating under vacuum permits lowering the boiling point of the product handled, and therefore permits operation with lower pressure steam; furthermore it permits operating at a temperature at which decomposition often does not occur, or is very much less than a higher temperature. In the case of such decomposition furthermore the chemical action on the materials of the still may be very much decreased on account of a lower rate of chemical action, as well as decomposition under a vacuum.

There is an additional advantage in case of vacuum distillation of a lower steam consumption under certain conditions. This applies, for instance, in the removal of one volatile material from another material in which it is in solution, where open steam is used as a distilling agent. Such a problem is involved in the removal of benzol from wash oil used in absorbing from coal gas.

The steam economy here is practically 80%, due not only to change in vapor pressure relations, but also to the fact that the materials handled do not have to be heated to as high a temperature, with consequent decrease in corrosion as well.

Continued on Next Page

STILLS—Continued

An advantage in distillation under a vacuum, not always appreciated, is in the fact that in the case of leakage all leaks are inward, and the danger caused through such leaks or loss by same can be avoided.

DISTILLING UNDER PRESSURE

Distillation under pressure cannot be employed as often as distillation under a vacuum, but in certain cases may have decided advantages, such as when removing a very volatile material from a solution where the volatile material boils at a temperature below that at which cooling water is available.

By operating such stills under pressure the boiling point of the volatile materials is raised, so that it may be condensed and collected under pressure, with water as a cooling agent, with an enormous economy, where brine might otherwise be required.

Such a problem exists in the case of distillation of acetaldehyde from solutions in water, of ethyl nitrite from solutions in alcohol, etc.

BADGER SERVICE IN STILL CONSTRUCTION

Outside of the general design of Stills as concerns particularly the arrangement and proportion of the parts, **Badger** Stills possess special features, such as perforated Boiling Cap construction, liquid flow and feed regulators, pressure regulators, etc., possessed by no other apparatus.

CENTRALIZED CONTROL FOR DISTILLING EQUIPMENT

We construct practically all our apparatus in our own shops with expert workmen, and under the supervision of men who have been in the metal working business for 50 years.

We have constructed Stills during the past few years of cast iron and steel, copper and aluminum, lead and silver lined, etc. On account of large amount of work which we have done, we have plans and patterns covering practically any size and design of apparatus and we therefore specialize in making prompt and quick shipments.

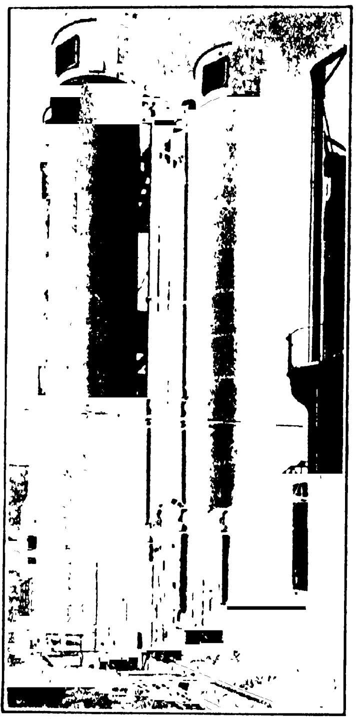
SOLVENT RECOVERY AND ABSORPTION EQUIPMENT

GENERAL

The great development in the chemical industry and the increasing high price of solvents have made the question of proper solvent recovery a very important one. There are furthermore many processes where extraction with volatile solvent can be employed to great advantage. We have had a great deal of experience in handling problems of this kind.

VAPOR PRESSURES

The laws of vapor pressure which govern practically all recovery operations of this type are little understood in their commercial application. By scientific study of the problems involved we have been able to effect enormous economies in operation and obtain recoveries which were not previously considered possible.



BENZOL ABSORPTION TOWERS

CHOICE OF PROCESS

Solvent extraction and absorption can be employed in the place of compression and distillation. The former usually has the advantage of offering opportunity for a practically complete recovery, whereas compression methods usually permit only at the best a fairly complete recovery. Very often an absorption equipment of proper design will make unnecessary the installation of refrigerating machinery, with an enormous economy in cost. We are familiar with the entire field, and can advise clients properly with regard to process and equipment.

SPECIAL PROBLEMS

In order to illustrate where absorption and solvent recovery equipment can be used to advantage, we would mention a few specific cases.

Acetaldehyde—In process recently developed for the manufacture of acetic acid, the efficient absorption of acetaldehyde from air and gas has been of great importance. This is a problem which we have solved, and the successful working out of the process made unnecessary the use of refrigerating plant otherwise required, which would have cost not less than $100,000.

Ethyl Nitrite—The recovery of this material from gas from a particular manufacturing plant illustrates the advantages of expert knowledge and careful design. It is also an example of absorption of material insoluble in water or in other solvent, such as, in this case, alcohol.

Phenol—In many cases solvent extraction can take the place of distillation with considerable economy, and the production of higher quality product. The

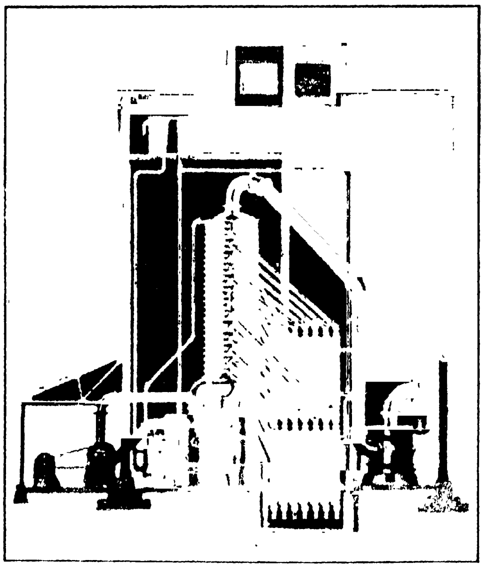
Continued on Next Page

production of carbolic acid from coal tar distillate, a problem of this kind, has been successfully solved.

SOLVENT RECOVERY, DISTILLATION EQUIPMENT

Ammonia—The application of our special design of distilling and scrubbing columns to the production of pure ammonia gas has been productive of very satisfactory results.

Acetone—The application of our cap plate water or brine cooled absorption system to the recovery of acetone and alcohol employed in the manufacture of cordite not only gives exceedingly high recovery, but permits the obtaining of a concentrated solution which can be distilled with great economy.



SCRUBBING TOWERS FOR SOLVENT RECOVERY

Benzol—The recovery of benzol from coal gas by absorption and subsequent distillation is very important at the present time. We have developed special forms of vacuum and gas heated stills, as well as absorption towers, which are exceedingly efficient and economical.

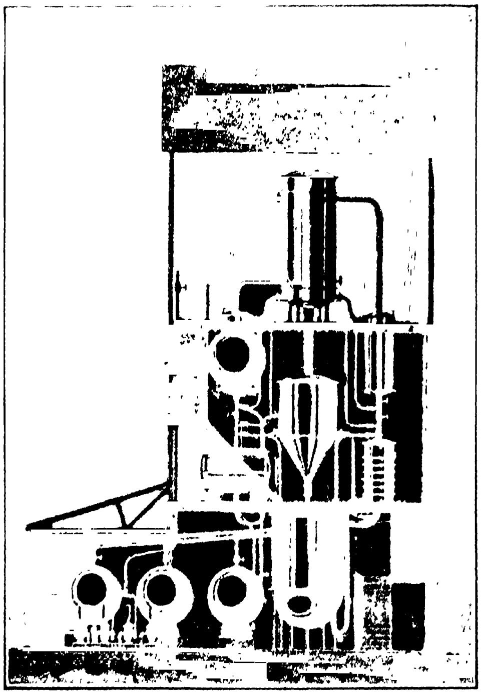
The above refers to the removal of benzol from coal gas. There is furthermore a very large field for the recovery of benzol, gasolene, etc., where employed for solvent purposes. Probably the largest application is in plants for the impregnation of fabric with rubber or rubber compounds, as in the manufacture of cord tires. At the present prices some of the larger concerns can affect an economy of approximately one million dollars per year through the recovery of these products. We have designed very complete systems for this work.

Ether—The recovery of ether in the manufacture of smokeless powder by absorption and suitable solvent requires long experience and efficient apparatus. We have given a great deal of study to this problem.

Miscellaneous—Solvent extraction and recovery equipment, however, can also be employed to advantage for the recovery of gums and resins from filtering materials; of asphalts from scrap; of fats and greases from residue; or from liquor, such as wool scouring liquors. Such problems are of interest to the leather manufacturers, manufacturers of asphalt products, woolen mills, chewing gum producers, etc. In each case the problem requires special attention.

Apparatus—The apparatus is as important as the general system, and involves many special features, such as **Webre** air cooler and heater, **Badger** cap type scrubbing towers and continuous coolers.

One feature of the design of solvent recovery equipment must be especially carefully considered. We find that many manufacturers consider absorption as being a practically instantaneous combination of solvent and solute, quite comparable to an ordinary chemical reaction or to the condensation of steam by cool water. As a result of absorption, equipment is usually designed without particular respect to length of contact or countercurrent stage principles or to the maintenance of low temperatures so long as all particles of solvent and solute come into contact. This is entirely wrong. In each particular case the design must be determined dependent upon heats of vaporization, boiling points, concentrations, etc., and the problem is a very complicated one if efficiency is to be obtained.



SOLVENT EXTRACTION PLANT

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EVAPORATORS

In many chemical projects it very often happens that one of the most important links in the chain of operations is the evaporator problem.

The most annoying features of such problems are their apparent simplicity. It is only after one has met with failure that one realizes the importance of this subject and the attention it deserves, for not only must the process be carried on successfully, but it must also be carried on economically, if the project in question is to be commercially remunerative. This involves studies, not only of the general behavior of the solutions in question, but also heat studies properly correlated with not only chemical and physical characteristics, but also local plant conditions, water supply and cost of fuel.

TRIPLE EFFECT EVAPORATOR FOR LOGWOOD EXTRACTS

Equipped as we are with an unusually capable staff of experienced engineers, we submit all propositions regarding installations to a very careful analysis, and our success in solving very difficult problems in the past has been due to this thorough study from both the theoretical and practical standpoints.

In our endeavor to build equipment adapted to various chemical and physical conditions we have evolved a number of designs which cover, in a general way, practically all ordinary problems. We find ourselves in a position, therefore, to build equipments for practically any purpose, such as

Sugar
Salt
Glycerine
Potash
Tanning Extracts
Dye-wood Extracts
Sulphates
Caustic Soda
Sodium
Benzo-sulphonate
Ammonium Phosphate
Urea
Water
Tomato Pulp

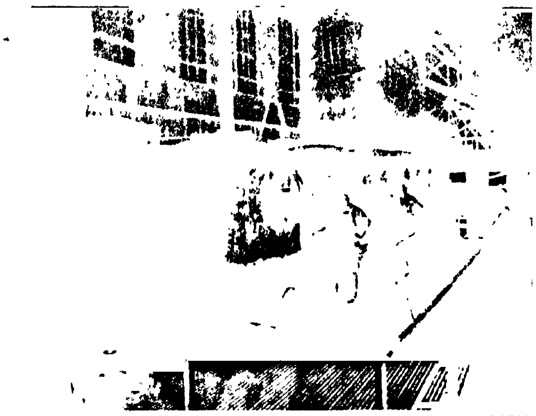
Glucose
Glue
Gelatine
Black Liquor
Sulphite Waste
Calcium and Magnesium Chlorides
Pyroligneous Acid
Calcium Acetate
Sodium and Potassium Nitrates
Mercerizing Liquors
Garbage Water
Distillery Waste, etc.

TYPES OF APPARATUS

THE WEBRE STANDARD EFFECT

This equipment is in common use for the majority of simple solutions. It is a vertical tube apparatus provided with positive and uniform steam and liquor circulation, thoroughly vented and drained. It is built in singles, doubles, triples, quadruples, quintuples and sextuples and can be supplied in all sizes from 25 sq. ft. per body to 9,000 sq. ft. per body or even larger, if necessary. One such equipment is now being built in quintuple effect containing 45,000 sq. ft.

EVAPORATORS—Continued


QUADRUPLE EFFECT EVAPORATOR HANDLING ACID LIQUORS

HIGH SPEED EVAPORATOR

This is a long tube apparatus and is especially adapted to foamy organic materials, particularly if these are subject to injury by long contact with heating surfaces. It has been used with signal success in concentrating milk and photographic gelatine. It has also been used very successfully on distillery slop and pyroligneous acid. It is foam proof and entrainment proof. A careful series of tests have shown that the entrainment losses do not exceed 1/50 of 1%.

The equipment is provided with circulation controls in which the amount of liquor actually circulating can be adjusted to any desired amount. It is very easy to operate. At one plant, one operator takes care of three quadruple effects with ease.

The amount of liquor contained in the equipment is very small and therefore the time exposure to heat is correspondingly small. The coefficient of heat transmission is very high, permitting the use of low temperature drop where this is advisable. In one case we are operating the first body of a quadruple effect with 5 lbs. steam pressure on the steam side, maintaining from 2 to 3 lbs. on the vapor side, even when the rate of evaporation is very high. The steam side is thoroughly vented of all non-condensable or corrosive gases, eliminating the possibility of air binding or corrosion on the steam side, if these gases contain injurious materials.

QUADRUPLE EFFECT FOR ACID LIQUORS—ANOTHER VIEW

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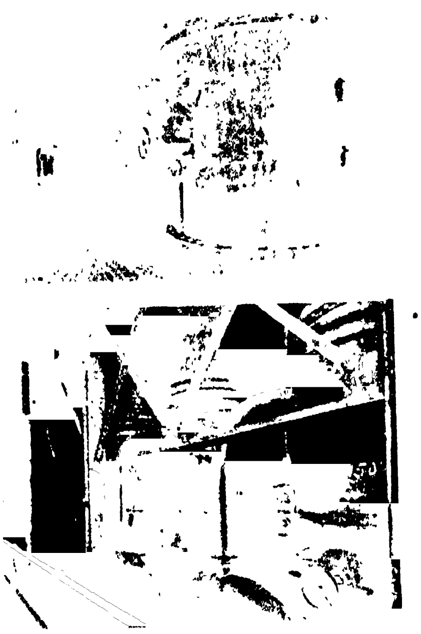
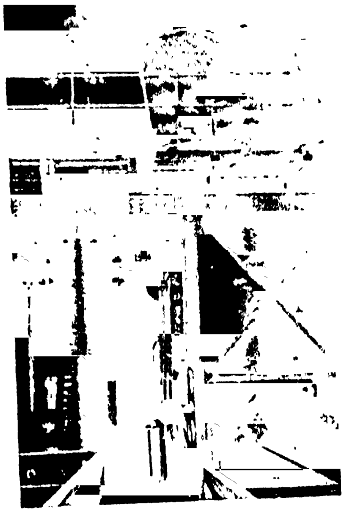
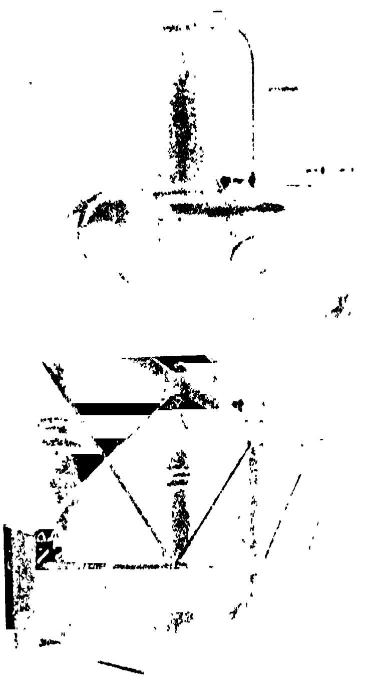
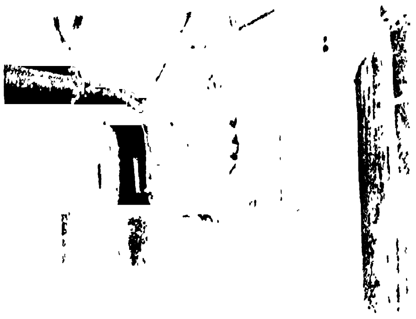






PHOTOGRAPHS SHOWING PARTS OF INSTALLATION OF FOUR COMPLETE QUADRUPLE EFFECT EVAPORATORS IN ONE PLANT, OF CAPACITY TO EVAPORATE 800,000 GALLONS OF WATER PER DAY.



CRYSTALLIZING EVAPORATORS

Not only have we built many equipments for crystallizing solutions, but we have been called on to make extensive investigations and carry on development work along these lines. We have three types of crystallizing evaporators which fulfil practically any but the most unusual requirements.

DISTILLED WATER EVAPORATOR

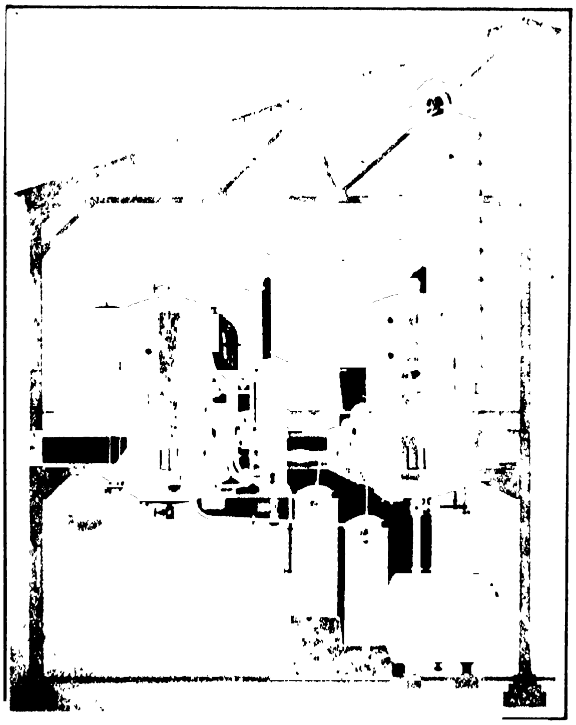
We are in a position to furnish distilled water equipment for make-up in power plants, ice factories or any other purposes for which there is a need. Here also we find that it is best to study local conditions carefully with a view toward securing the best result. Our selection of type of evaporator and cycle of operation will be governed by individual requirements. For instance, in different plants, one of the following combinations would be most useful:

1. A multiple effect operating entirely on live steam and discharging vapors from the last body at a back pressure of 15 to 20 lbs.
2. A multiple effect operating on steam at 10 to 12 lbs. pressure and discharging vapors from the last body at atmospheric pressure.
3. Multiple effect operating on steam at low exhaust pressure and discharging vapors into the condenser at relatively high vacuum.
4. A multiple effect operating on steam at 15 to 20" of vacuum, and discharging vapors into a condenser carrying 26 to 27" vacuum.
5. A single effect operating under any of the above conditions.
6. A single effect operating on a low drop of 10 to 15°F. at any specified zone of temperatures.
7. A good illustration of special problems along this line would be a triple effect producing distilled water for make-up in a power plant, operating with exhaust from the auxiliaries at 0 lbs. pressure, provided with a small surface condenser and using for circulating water, the con-

Continued on Next Page

EVAPORATORS—Continued

densate from the large surface condensers. Here, of course, it is necessary to study and balance all plant conditions so that the apparatus will fulfil the requirements economically.



EVAPORATOR FOR ACETATE OF LIME AND PYROLIGNEOUS ACID

SPECIAL WORK

Where unusual problems present themselves, we can undertake careful studies and analyses of these conditions and carry on experimental development work, if necessary, with a view to future construction to fulfil the requirements imposed.

BADGER-WEBRE EVAPORATOR SEXTUPLE EFFECT

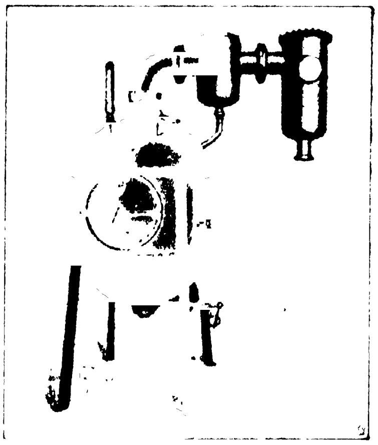
VACUUM PANS

We make a specialty of the manufacture of Vacuum Pans of iron, copper, lead, silver or tin-lined, copper or steel.

These pans may be fitted with our special manholes, foot valves, sight-glasses, thermometer and liquor testing attachments, catch-all, spray or surface condensers and vacuum pumps and are specially designed for handling milk, dyes, tanning, fruit and medicinal extracts, confectionery, etc.

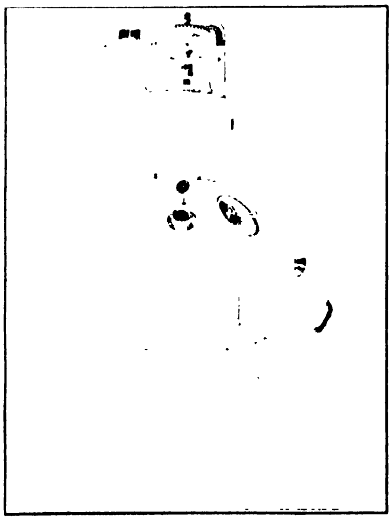
We have recently made installations of special tin-lined vacuum pans for the concentration of urea. We have designed special equipments for the recovery of distilled solvents which have great advantages over equipment previously employed.

They are built in any capacity from 25 to 1500 gallons or larger.



VACUUM PAN

SPECIAL VACUUM PAN



VACUUM PAN FOR FOOD PRODUCT

Continued on Next Page

DEALCOHOLIZING PLANTS

As stated under the heading "Industrial Alcohol Plants," there is a large demand at the present time for equipment for the removal of alcohol from products such as wine, beer, patent medicines, etc. In most cases the object is not only to produce a substantially alcohol-free product of a saleable nature, but also to recover industrial alcohol of a high degree of purity. The requirements of equipment of this type are as follows —

SEPARATOR

1 The material must be subjected to the action of heat for a very short time
2—The temperature must be maintained at as low a point as possible
3—Practically all of the materials are of a foamy nature Equipment must be designed to handle this type of material
4—The operation should, if possible, be continuous
5—The alcohol should be removed in most cases at as high a concentration as is reasonably possible This prevents in most cases the removal of various flavoring materials
6—The apparatus must be constructed of material which will not injure the product.

We have designed as a result of our experience and extended experiments a type of machine which is admirably suited to accomplish the above results. We have made installations for handling beer, wines, extracts and medicines.

In our process the material is introduced continuously into the machine, where it is heated in a thin film for a period of approximately two minutes, the alcohol being removed at a concentration of 10% to 50%, depending on the alcoholic content of the particular product. One very detrimental feature of substantially every other system for dealcoholizing work lies in the fact that the material is brought into contact with the heating surface, which is of necessity at a considerably higher temperature than the product itself.

CONDENSER

DEALCOHOLIZING PLANTS—Continued

HEATER

In our system the heating is accomplished by means of pure distilled water vapor at a temperature which is the same as that of the material which is being dealcoholized. In this way the material comes in contact with no heating surface whatever, and is therefore much less affected by heat than otherwise.

Refining Equipment—The alcohol removed (low wines) must be further treated to obtain a commercial product. The main part of the equipment required for concentrating and purifying the low wines resulting from the dealcoholizing of beer and other liquors is the distilling or rectifying equipment. There are three general types of stills which can be employed for this purpose —(1) Discontinuous Still, (2) 2-Column Continuous Still, (3) 4-Column Continuous Still.

Discontinuous stills possess many disadvantages In addition to their inability to produce pure alcohol, except through repeated operations, they require large storage capacity for low wines, intermediate products, etc They have a large steam consumption, approximately 50 to 60 lbs of steam per gallon of alcohol. They also require larger building space in view of tank requirements and necessitate very intelligent supervision Consequently discontinuous stills are only recommended for small capacities where the amount of alcohol recovered is never greater than 200 gallons per day and where the weekly production falls off considerably during the major portion of the year.

Badger-Barbet continuous stills can be applied with advantage to the work of rectifying alcohol (low wines) from dealcoholizing plants.

DISTILLING COLUMN

CONTINUOUS STILLS

Continuous stills operate, as the name indicates, in a continuous manner, the low wines being charged into them continuously and the product removed in the same manner. For details see under Industrial Alcohol Plants on page 313.

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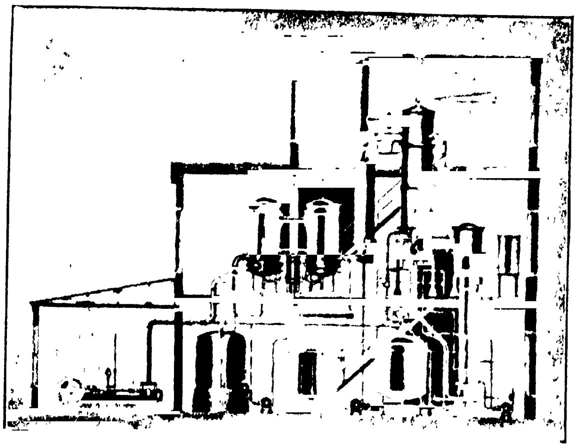
EXTRACTION PLANTS


EXTRACTION AND CONCENTRATION PLANT

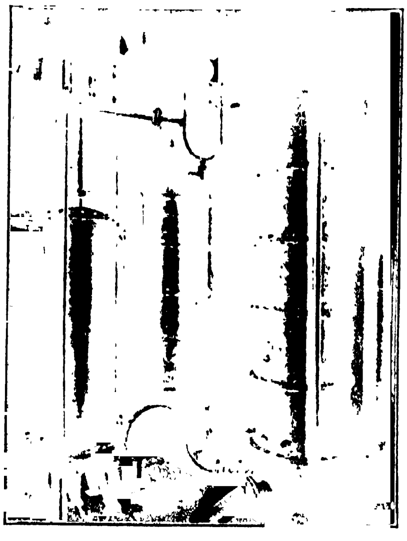
OIL EXTRACTION OR DEGREASING PLANTS

The increasing shortage of fats and oils, and the necessity of recovery of gums, resins, etc., and of the purification of oily and greasy residues, have required extensive development of this industry. We specialize in the design of economical machinery for the direct extraction of oil from crushed seeds, grease from bones, tankage, press cakes, etc.

The design of such equipment varies greatly according to the nature of the material handled. In some cases stationary extractors are satisfactory; in other cases the use of rotary extractors is essential.

The chemical extraction of many materials, furthermore, requires the use of battery extractors in order to obtain complete extraction, and also a high concentration of the extracted material in solvent. Since the solvent extraction problem always involves the recovery of the solvent by distillation, it is evident that our extended experience in distillation lines should enable us to furnish very efficient equipment for this work.

In a recent installation we were able, through redesign of the distillation equipment which it was intended to install, to cut down the first cost of equipment about 40 per cent., and to cut down the steam and water requirement to 25 per cent. of that which would have been necessary under the original design.

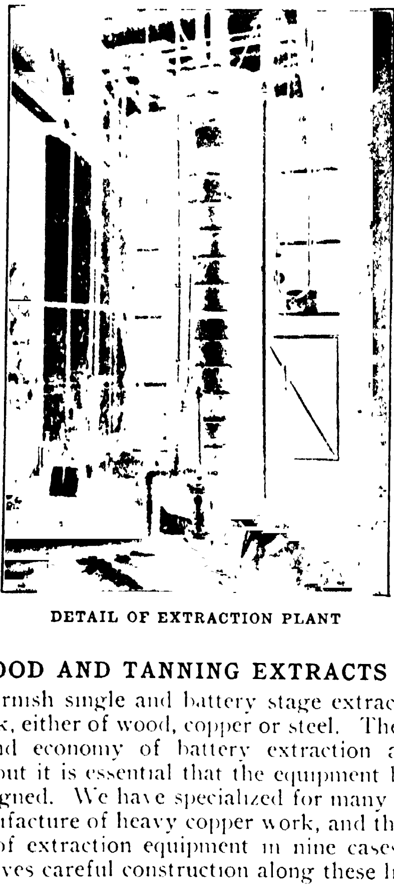

SPECIAL COLUMNS FOR EXTRACTION PLANT

Among the primary requirements for an extraction apparatus, outside of heat and solvent economy, are simplicity of design and operation, safety from fire when using inflammable solvents, etc.

It is evident from the above that each extraction problem should be very carefully considered.

EXTRACTION FROM SOLUTIONS

The production of various synthetic products requires the extraction of materials from solution by the use of immiscible solvents. We have devised special apparatus for this work. We have furthermore developed a solvent extraction process which in some cases can replace distillation methods, with a great economy in operation.


DETAIL OF EXTRACTION PLANT

LOGWOOD AND TANNING EXTRACTS

We furnish single and battery stage extractors for this work, either of wood, copper or steel. The advantages and economy of battery extraction are well known, but it is essential that the equipment be properly designed. We have specialized for many years in the manufacture of heavy copper work, and the manufacture of extraction equipment in nine cases out of ten involves careful construction along these lines.

EXTRACTION OF FOOD PRODUCTS

The production of extracts, such as coffee and tea, is becoming more and more important. We have recently designed, after extended experimentation, a system of extraction for coffee, for instance, which represents a great improvement over processes used by large concerns for years. We are able to secure much more complete extraction, with great economy in steam and water requirements for subsequent evaporation.

Continued on Next Page

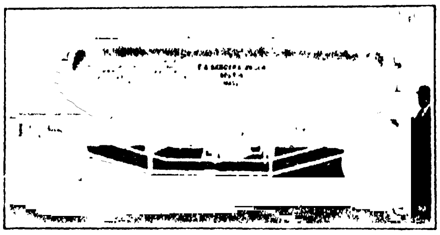
AUTOCLAVES AND DIGESTERS

We make a specialty of the manufacture of heavy copper or lead-lined digesters or autoclaves, diffusion batteries, etc.

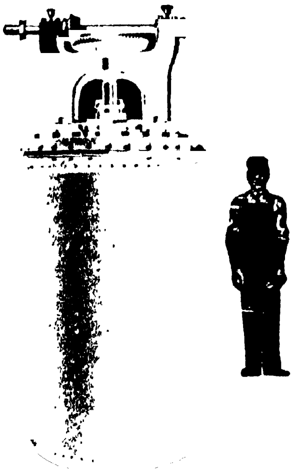
At the present time the Auto-Saponification of fats for the production of high grade glycerine and fatty acids for distillation is attracting considerable attention in this country and we are equipped to furnish the necessary equipment complete.

The extraction of tanning extracts under pressure is another field in which there will be great improvements. We construct diffusion batteries of most efficient types for this work.

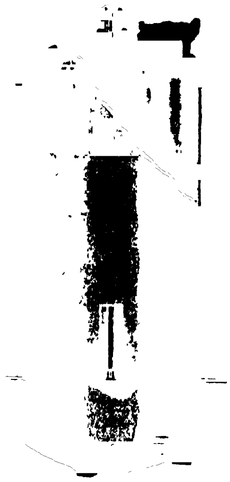
The production of many dyes and synthetic products requires the use of Autoclaves of steel and copper, and lead and silver lined, sometimes for very high pressures. Our long experience in this line, which necessitates expert knowledge, careful construction, and the best of material, together with our patented lining processes, fit us particularly for this work.



COPPER DIGESTER

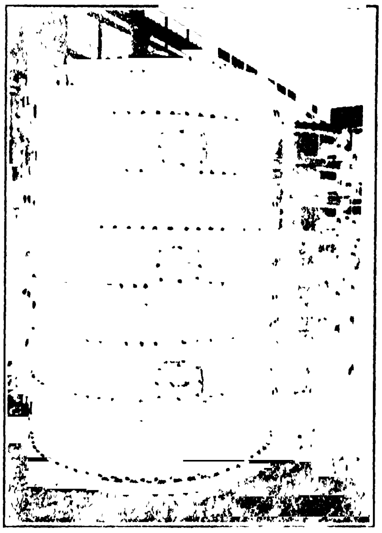


LEAD-LINED AUTOCLAVE



LEAD-LINED DIGESTER

HOMOGENEOUS SILVER- AND LEAD-LINED COPPER AND STEEL APPARATUS



LEAD-LINED PURIFYING COLUMN

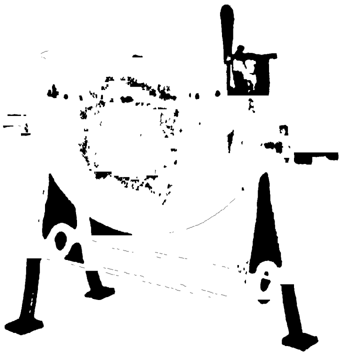
For many years we have been successful manufacturers of homogeneous silver- and lead-lined copper and steel apparatus. We have recently developed a process of homogeneous tin lining which has proven very satisfactory. We have found that many concerns have uses for equipment of this nature, but are not aware that the same is manufactured in this country. The equipment indicated on cuts herewith has been manufactured by us recently. Other installations made during the past few years cover lead-lined kettles, stills and digesters, silver-lined kettles and autoclaves, tin-lined stills, kettles, evaporators, tin-covered coils, etc.

So far as we know, no other concern possesses the facilities for manufacturing this type of equipment, nor the expert workmen required to carry out the work.

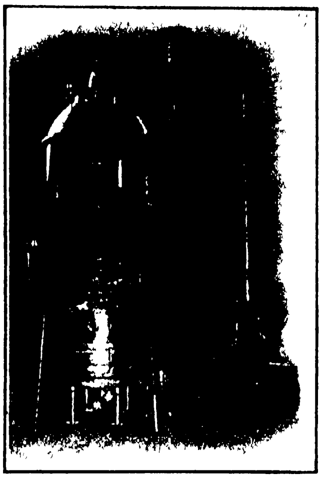
TIN LINED KETTLE

Continued on Next Page

SPECIAL APPARATUS

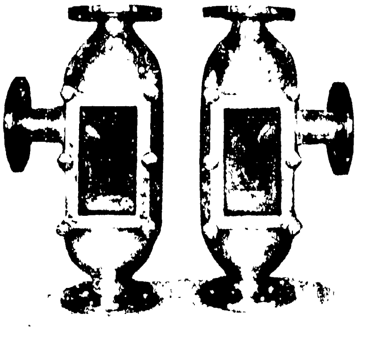

SILVER-LINED JACKETED KETTLE

It is often necessary to construct special equipment, some of which we refer to in previous paragraphs, where we are referring particularly to the lining process itself. Such equipment comprises, for instance, Scrubbers, Mixing Stills, drying equipment, etc.


CRYSTALLIZING EVAPORATOR

We have solved a great many problems involving such apparatus.

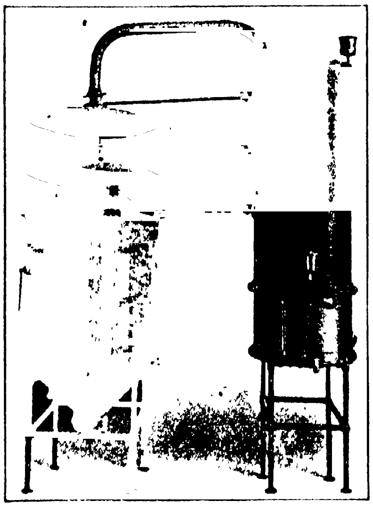
We might refer to our silver-lined digesters, copper-lined autoclaves, tin-lined evaporators, apparatus for ether extraction from water solutions, lead-lined steam jacketed scrubbing towers, etc., as examples of such special equipment. Problems of this kind involve careful and expert design and chemical engineering experience, as well as most expert construction.


SOLID SILVER SIGHT BOXES

In the course of designing and erecting complete plants we have often had to devise new special valves, fittings, measuring devices, automatic control equipment, gauges, meters, etc., in order to exactly meet requirements for which no standard equipment already on the market would be suitable. Our plant is completely equipped to attend to such details, which contribute in no small degree to the success of our installations.

EXPERIMENTAL WORK

It is obvious that the design of our own equipment requires experimental work, often on a considerable scale. We often carry on operations on a small plan or miniature industrial scale in our own shops or laboratories, however, for our customer's benefit.


SPECIAL STILL

Inasmuch as our returns are obtained through the sale of machinery and equipment, we ordinarily make no charges for this work, even though it may involve processes with which we are not concerned.

We shall be pleased to consider inquiries requiring such work. It will be evident that we have exceptional facilities for adapting equipment in our shops to any work on hand.

STEAM-JACKETED MIXING STILL

Continued on Next Page

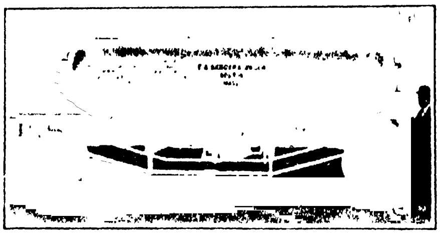
AUTOCLAVES AND DIGESTERS

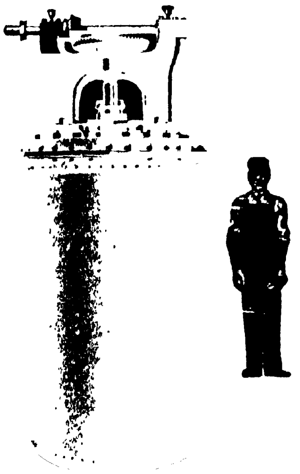
We make a specialty of the manufacture of heavy copper or lead-lined digesters or autoclaves, diffusion batteries, etc.

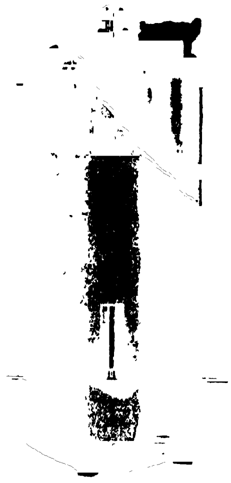
At the present time the Auto-Saponification of fats for the production of high grade glycerine and fatty acids for distillation is attracting considerable attention in this country and we are equipped to furnish the necessary equipment complete.

The extraction of tanning extracts under pressure is another field in which there will be great improvements. We construct diffusion batteries of most efficient types for this work.

The production of many dyes and synthetic products requires the use of Autoclaves of steel and copper, and lead and silver lined, sometimes for very high pressures. Our long experience in this line, which necessitates expert knowledge, careful construction, and the best of material, together with our patented lining processes, fit us particularly for this work.

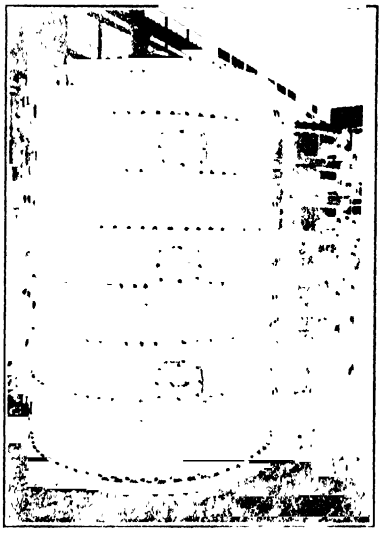

COPPER DIGESTER


LEAD-LINED AUTOCLAVE


LEAD-LINED DIGESTER

HOMOGENEOUS SILVER- AND LEAD-LINED COPPER AND STEEL APPARATUS

For many years we have been successful manufacturers of homogeneous silver- and lead-lined copper and steel apparatus. We have recently developed a process of homogeneous tin lining which has proven very satisfactory. We have found that many concerns have uses for equipment of this nature, but are not aware that the same is manufactured in this country. The equipment indicated on cuts herewith has been manufactured by us recently. Other installations made during the past few years cover lead-lined kettles, stills and digesters, silver-lined kettles and autoclaves, tin-lined stills, kettles, evaporators, tin-covered coils, etc.


LEAD-LINED PURIFYING COLUMN

So far as we know, no other concern possesses the facilities for manufacturing this type of equipment, nor the expert workmen required to carry out the work.

TIN LINED KETTLE

Continued on Next Page

E. B. BADGER & SONS COMPANY

BOSTON, MASS., U. S. A.

NEW YORK OFFICE 101 Park Avenue — CHICAGO OFFICE 8 So Dearborn Street

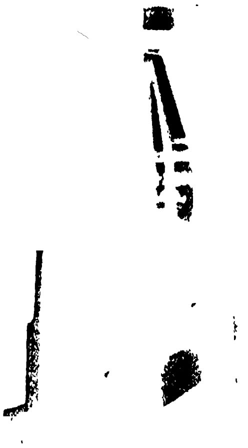
PRODUCTS (SPRAY)

Water Cooling Systems; Air Washers; Air Conditioning Apparatus; Air Coolers; Smoke Washers; Odor Condensers; Gas Scrubbers; Humidifiers; Spray, Sewage and Aerating Nozzles; Spray equipment for acid plants.

USES FOR SPRAYING EQUIPMENT

Cooling water for condensers, stills, etc., to afford 28" vacuum or better.
Cooling liquids and spraying brine for refrigerating plants.
Cooling, spraying and washing oils.
Spray system for sulphuric acid plants
Evaporating or densifying liquids by spraying at moderate temperature, resulting in fuel economy.
Spray plants for atomizing purposes.
Spray washers for scrubbing gases
Dust precipitation and collection.
Aerating and purifying water supplies.
Condensing and absorbing odors and vapors
Washing and humidifying air.
Cleaning blast furnace gases.
Reclaiming gasoline, etc.
Removing suds from paper machines.

SPRAY NOZZLES

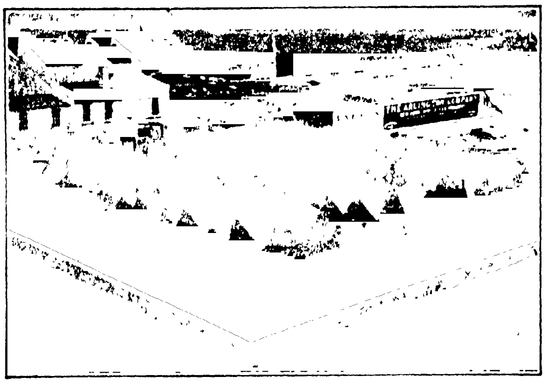


Our nozzles operate on the centrifugal principle, as extensive experience with all types of nozzles has shown it to be the simplest and most efficient means to atomize water. An examination of our nozzles will show it consists of two parts: a shell and a stationary turbine center that produces the centrifugal effect. The vanes in the center are very carefully made so as to gradually change the direction of flow and thus avoid the formation of eddy currents. The water passages are large and short, preventing clogging, and resulting in a highly efficient type of nozzle. The nozzles are usually made of composition, but any suitable material can be used where corrosive liquids have to be sprayed.

CONSTRUCTION SPRAY NOZZLE

SIZES AND CAPACITIES

Size of Nozzle	Diam of Orifice	Diam. of Supply	Capacity in gallons per minute at various pressures —Lbs. per square inch					
			6	8	10	15	20	30
No. 2	1-32"	¼"	043	05	.055	068	079	.096
No 3	1-16"	¼"	.177	204	.228	28	322	395
No 4	3-32"	¼"	41	48	535	65	75	93
No 5	⅛"	⅜"	75	.86	96	1 16	1 34	1 64
No 6	3-16"	½"	1 79	2 06	2 3	2 82	3 26	4
No 7	¼"	¾"	3 44	3 97	4 45	5 45	6 3	7 7
No 8	5-16"	1"	5 6	6 5	7 2	8 8	10 2	12 5
No 9	⅜"	1¼"	8 3	9 5	10 7	13	15.	18 5
No. 10	½"	1½"	15.5	17.8	19 9	24 4	28	34 5
No 11	⅝"	1½"	24 7	28 2	32.	39	45.	55.
No. 12	¾"	2"	36.4	42	47.	57 5	66 5	81.
No. 13	⅞"	2"	50.	58	64 5	79	81.	112
No. 14	1"	2½"	66	76	85.	105	120 00	148.
No 15	1¼"	3"	105	122.	135.	165	190	234.



INSTALLATION COOLING 5000 GALLONS PER MINUTE
Arlington Plant, E. I. du Pont de Nemours & Co.

COOLING WATER

Our spray equipment is well adapted to cool water economically and efficiently. The cooling range varies with the humidity. In moist climate it usually approximates 20° F., but in hot, dry localities it may be as much as 30° F. or 40° F. The minimum limit to which water can be cooled is to within a few degrees of the wet bulb temperature. The cost of our spray system is much less than a cooling tower of same capacity, while the maintenance and operating expense is about one-half as much. The cooling range is somewhat greater. Where ground space is limited the sprays can be installed on the roof or if a natural pond is available they can be installed over same. In most cases an earthen pond will be satisfactory but we have standard designs in concrete that can be economically constructed.

Water Loss—This seldom exceeds 2% of the volume of water sprayed. It includes the loss from evaporation and drift. The latter loss is negligible. The yearly average loss will approximate only 1% and winter loss only ½%.

Spray Parts—Our engineers having developed group spraying, spray arms, spray heads, and spray tees, all of which are now standard practise, we are prepared to furnish promptly nozzles or any other parts that are interchangeable with existing spray systems. It will pay you to get our quotations on same.

Continued on Next Page

AUTOCLAVES AND DIGESTERS

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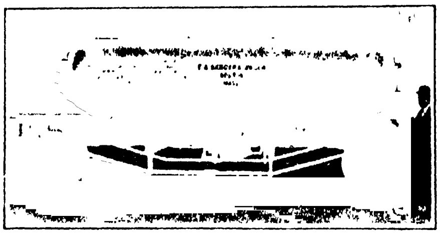
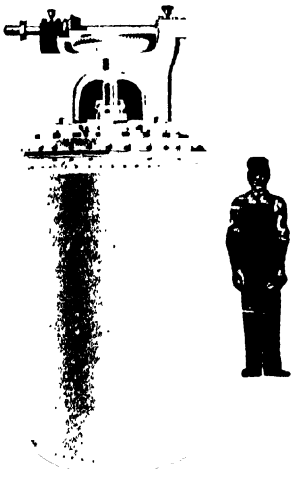
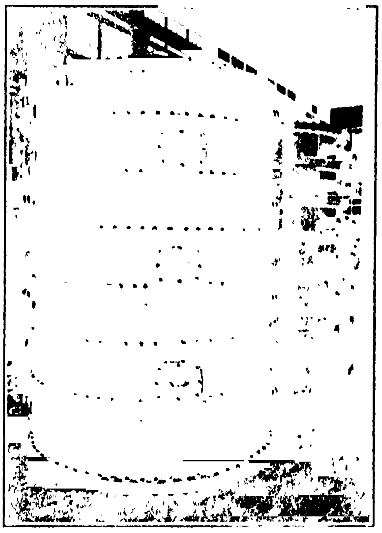

COPPER DIGESTER


LEAD-LINED AUTOCLAVE

LEAD-LINED DIGESTER

HOMOGENEOUS SILVER- AND LEAD-LINED COPPER AND STEEL APPARATUS


LEAD-LINED PURIFYING COLUMN

TIN LINED KETTLE

For many years we have been successful manufacturers of homogeneous silver- and lead-lined copper and steel apparatus. We have recently developed a process of homogeneous tin lining which has proven very satisfactory. We have found that many concerns have uses for equipment of this nature, but are not aware that the same is manufactured in this country. The equipment indicated on cuts herewith has been manufactured by us recently. Other installations made during the past few years cover lead-lined kettles, stills and digesters, silver-lined kettles and autoclaves, tin-lined stills, kettles, evaporators, tin-covered coils, etc.

So far as we know, no other concern possesses the facilities for manufacturing this type of equipment, nor the expert workmen required to carry out the work.

Continued on Next Page

BAKER & CO., INC.

NEWARK, N. J.

NEW YORK OFFICE
30 Church Street

CHICAGO OFFICE
5 South Wabash Avenue

PRODUCTS

Platinum Laboratory Apparatus, including: Crucibles; Combustion Apparatus; Dishes; Pans; Triangles; Filter Cones; Filter Crucibles; Gooch Form; Electrolytic Separation Apparatus; Spoons; Tweezers; Stirring-Rods; Tongs; Platinum Wire, Sheet, Sponge, Salts and Solutions; Platinum ware repaired.

BAKER PLATINUM WARE

Only specially refined Platinum is used in **"Baker"** laboratory ware.

Each piece of Platinum apparatus is tested by us before shipping, and is guaranteed to be free from flaws, blisters or other defects of material or workmanship.

Old crucibles, dishes and appliances of all forms reshaped, repaired, purchased or exchanged for new ware.

Our catalog "Data Concerning Platinum" will be sent on request.

PLATINUM CRUCIBLES, WITH OR WITHOUT COVERS

Hammered and Guaranteed

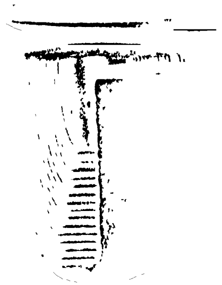


FIG. 4
10 C C to 90 C. C. Inclusive

Capacity in C. C.	Approximate Weight in Grammes	Diameter and Depth in Cm
8	8	2 2
10	10	2 5
15	15	3 0
20	20	3 3
25	25	3 5
30	30	4 0
40	40	4 2
50	50	4 4
60	62	4 7
70	65	5 0
80	68	5 3
90	70	5 4
100	80	5 6
110	90	5 7

Covers are always furnished with crucibles unless otherwise ordered
Crucibles of other weights and capacities made to order
Gold, silver and gold lined platinum crucibles made to order

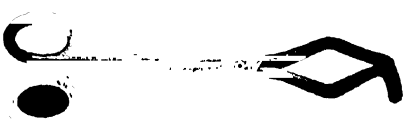


FIG. 35—CRUCIBLE TONGS
Nickel plated, with hollow platinum tips

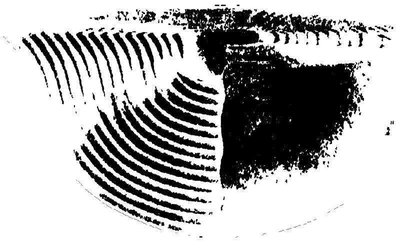
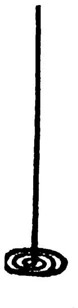


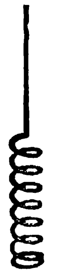
FIG. 6

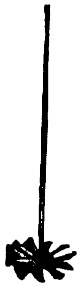
PLATINUM DISHES, WITH OR WITHOUT LIPS

Round Bottom—Hammered and Guaranteed

Capacity in C C	Approximate Weight in Grammes	Diameter Cm	Depth Cm
15	5	3 8	1 0
20	6	4 2	2 0
25	8	4 4	2 2
35	12	4 8	2 4
50	17	5 6	2 7
65	22	6 5	3 0
75	25	6 5	3 3
100	33	7 2	3 5
125	42	7 8	3 7
150	50	8 4	3 7
175	55	8 9	4 1
200	67	9 4	4 3
250	80	9 8	4 5
300	94	10 4	4 8
350	117	11 1	5 0
400	133	11 5	5 4







PLATINUM ANODES FOR ELECTROLYTIC SEPARATIONS

Fig 54	Fig 55	Fig 56	Fig. 98
Diam ⅞ in	Diam ⅞ in.	Diam ⅝ in.	Diam 1 in.
Height 4½ in	Height 4 in	Height 6½ in.	Height 4 in
Weight 7 gms	Weight 5 gms	Weight 7 gms.	Weight 6 gms

PLATINUM GAUZE ELECTRODES

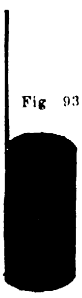


Fig 93

52 mesh to 1 inch Weight 6 grams	45 mesh to 1 inch Weight 14 grams

Fig 92

	In
Diam of Cylinder	1
Height of Cylinder	2
Height of Stem	2
Height, Over All	4
Diam of Stem	040

JOSEPH BAKER SONS & PERKINS CO., INC.

Sole Sales Agents for

Werner & Pfleiderer Machinery and
Appliances Used in the Chemical, Pharmaceutical,
Food and Allied Industries

27 WEST 43RD STREET, NEW YORK, N. Y.

GENERAL OFFICES
White Plains, N. Y.

FACTORIES
Saginaw, Mich.

PRODUCTS

"Universal" Kneading and Mixing Machines for all purposes; Automatic Sifting, Blending, Conveying and Weighing Plants for Flour, Powdered Sugar, Carbon Flour and materials of similar consistency; Baking and Drying Ovens; Hydraulic and Screw Presses for extrusion of plastic masses, etc.; Rapid Dissolvers for China Clay, Kaolin, Salts, etc.; Rubber Cement, Compounding, Masticating and Washing Machines; Vacuum Mixing Machines; Complete installations for the manufacture of Bread, Biscuit and Wafers, Macaroni, Noodles, Chocolate and Candy, Automatic Traveling Ovens.

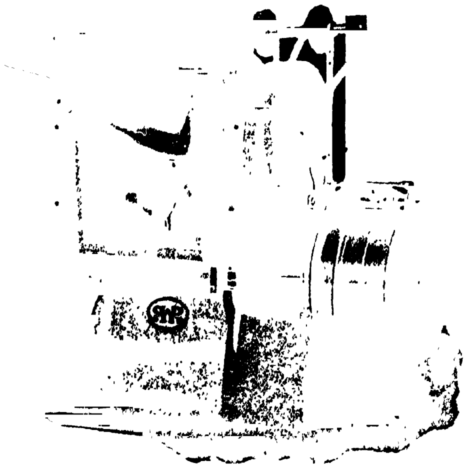
In addition to the data given on this page, more extensive information regarding our equipment and its uses may be found on pages of this publication under the caption **Werner & Pfleiderer Company.**

SIZES AND STRENGTHS

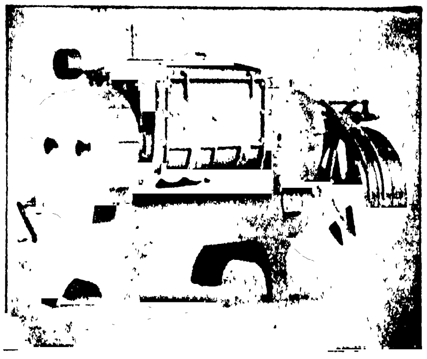
The great range in sizes of "Universal" Kneading and Mixing Machines, from ¼ gallon up to 2650 gallons, covers the most diversified requirements. Full assurance of filling your exact needs obtains in the fact that each size of "Universal" is built in various strengths, excepting only the smaller of the laboratory machines.

TEMPERATURE CONTROL AND SPECIAL FEATURES

All sizes of our mixers may be jacketed for either heating or cooling, fitted with various styles of covers, and equipped with easily renewable special metal linings and special metal mixing blades for resistance to abrasion or corrosion. Serrated saddle in the mixing trough and serrated removable shoes for the blades can be supplied to effect a pulping or shredding action.



SIZE 14, TYPE VII, CLASS BB
Cast Iron Trough with Serrated Saddle, Blades with Serrated Shoes, and Vaulted, Counterbalanced Cover. (Tilted Position.)

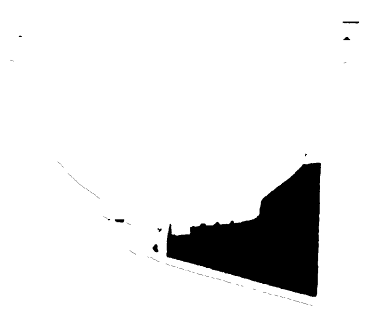


SIZE 14, TYPE V, CLASS BB
Cast Iron Trough, Vaulted Counterbalanced Air tight Cover Working Position

From our wide experience in this phase of the chemical and food industries, we can undoubtedly give you valuable assistance on problems that may have previously defied mechanical handling.

RAPID DISSOLVER

A simple yet efficient machine for the rapid and energetic dissolving or distribution in suspension of earths or chemicals, soluble or insoluble, operating with a minimum of power.



RAPID DISSOLVER, SIZE 1
Built in sizes from 2½ gallons up to 1250 gallons

BALTIMORE COPPERSMITH CO.

Manufacturers of

Copper Chemical Equipment

1914 Aliceanna Street

BALTIMORE, MD.

PRODUCTS

Coppersmithing for Chemical Engineers and all kinds of Industrial Chemical Plants, including:

- **Coils of all kinds**
- **Condensers**
- **Distilling Equipment**
- **Extracting Apparatus**
- **Dye House Apparatus**
- **Copper Tanks**
- **Heaters**
- **Coolers**
- **Boilers**
- **Yeast Plant**
- **Jacketed Kettles**
- **Agitator Kettles**
- **Varnish Kettles**
- **Vacuum Pans**
- **Jacketed Pans**
- **Stills**
- **Stirrers**
- **Ladles**
- **Steam Tables for Dyers, and Finishers, Etc.**

EXPERIENCE

We have been for years in the Coppersmithing business, during which time we have successfully made a large variety of equipment for:

- Dyers
- Bleacheries
- Textile Finishing Plants
- Varnish Makers
- Distillers
- Chemists
- Confectioners
- Silk Printers
- Laboratories
- Yeast Plant Equipment

The workmanship of our equipment is of the very best, and we believe that our prices are unequaled for similar workmanship and quality of material. We wish, however, to draw special attention to our facilities for handling special work in accordance with the designs of engineers and chemists.

FACILITIES

Our plant is modern and well equipped, and located at Baltimore, Md., which is conveniently near the largest manufacturing districts of the East. We have access to all the principal railroad systems, and can also ship by water to points on the Atlantic seaboard, and elsewhere. These facilities enable us to make prompt and economical deliveries of even the largest equipment.

SPECIAL CONSTRUCTION

We can build any equipment that falls within the scope of a coppersmithing establishment.

Chemical engineers and factory managers can submit drawings to us and we will be pleased to estimate on them. In many cases we can submit suggestions with regard to the building of such equipment based on our long experience in fabricating equipment from copper. In brief, we will cooperate with the designer and buyer of the equipment in an intelligent and mutually helpful manner.

STEAM JACKETED KETTLES, STATIONARY

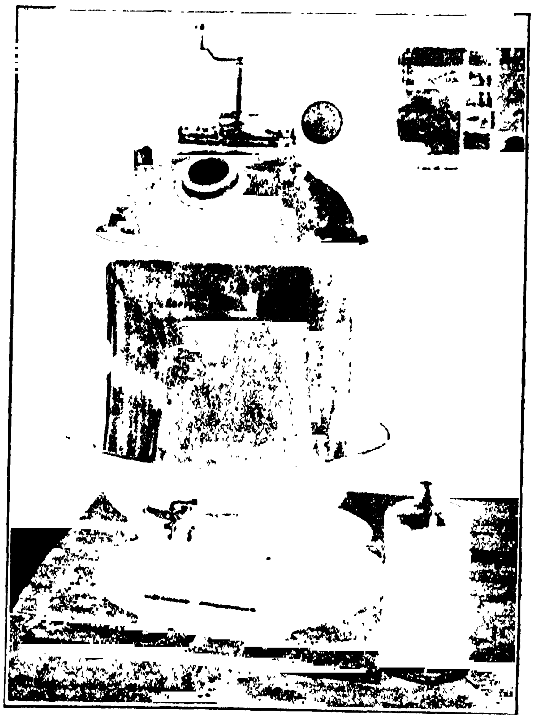
These kettles are made of heavy copper, strongly hammered and well riveted. They have a frame of iron as shown in the cut, and ample steam space to insure even and rapid boiling. Made from 5 gallons to 600 gallons' capacity, and tested before leaving our works.

STEAM JACKETED TILTING KETTLE

Made in the same manner and of the same material as the steam-jacketed stationary kettles. Made in all sizes up to 70 gallons. Guaranteed in every respect.

DYE KETTLES

Made in sizes from five gallons up. Can be carried around plant. Are supported by a heavy iron ring at bottom. Can be supplied tin lined if desired.



YEAST CULTURE KETTLE

VACUUM PANS, LABORATORY SIZE

The capacities of these pans range from 10 to 20 gallons.

The small laboratory sizes are supplied with legs and are built for hard service. These are complete in every detail of construction, when compared to the larger types used for manufacturing, and can be supplied with or without agitator, and equipment for belt or motor drive. The style of our vacuum pans in regard to the hand-hole near the bottom makes the interior easy of access for observation or discharge.

BARNSTEAD STILL AND STERILIZER CO.

BOSTON, 30 MASS., U. S. A.

PRODUCTS

- **Water Distilling Apparatus.**
- **Alcohol Recoverers.**
- **Sterilizing Equipment.**

TYPE "C," COMMERCIAL STILL

This still, recommended for continuous operation, is designed for use where high pressure steam, from 60 to 150 pounds, is available for heating

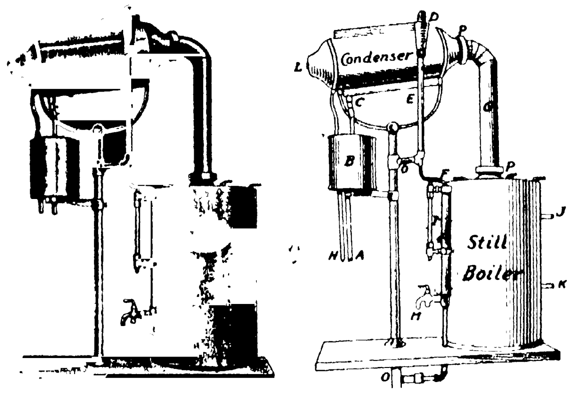
It is made of heavy copper and composition, and thoroughly coated with pure block tin on all parts that come in contact with the water. Finished outside in white nickel with galvanized casings.

The heating coil, easily detachable for cleaning, is an annular coil of government composition, preferable to copper as it requires less space because of a much greater heating surface.

Adaptable for the requirements of large laboratories, bottlers, manufacturing chemists, soap manufacturers, ice plants and textile mills.

Once the still is started, the heat generated in the boiler pre-heats the incoming raw water thereby reducing the amount of live steam required for heating

The operation is effective, automatic and continuous. All gaseous and organic impurities are removed and the water is made chemically pure



COMMERCIAL STEAM STILL

No	Capacity Gal per Hr	Space Required Length	Space Required Width	Space Required Height	
0 A	1	.	..		Prices upon application
00	2	.	..	.	
0	5 to 7	..	.	..	
1	10 to 15	36	12	42	
2	15 to 20	48	18	54	
2½	20 to 25	50	23	58	
3	25 to 30	60	30	78	
4	50	66	30	82	
5	75	72	34	86	
6	100	76	38	90	
7	200	..	.		
8	500	.	..	.	
9	1000	..	..	..	

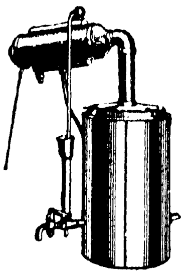
Operation The water to be purified is supplied by pipe A and passing through cooler B enters the condenser at C, circulating around the condenser tubes becomes heated to boiling and is discharged into an open connection at D, where the ammoniacal and other gases are thrown off The water thus purified passes down pipe F A sufficient quantity enters the still boiler at F, is made into steam, the surplus condensing water flows to waste through overflow pipe O, a continuous stream running while operating still

The steam being raised to a temperature sufficiently high to destroy all germ life, thence passing up steam pipe G to the condenser, is there condensed, the distillate flowing through a block-tin coil in the cooler B is discharged at H, chemically pure

The water entering the cooler B cools the distillate and absorbing the units of heat becomes heated as it passes to the condenser and to the boiler The heat for operating the still is by steam applied by connection with a steam boiler at J, the steam passing through annular coils and returned to the boiler through pipe connected at K

To clean the still boiler, remove clamps PP, steam pipe G, and cover The interior is accessible, the water and sediment being drawn off at cock M When operating allow a little stream to issue from vent L, at end of condenser, thus preventing absorption of impurities from the atmosphere The quantity of steam that issues from said vent is governed by the cold water admitted through supply pipe A.

TYPE "L" LABORATORY STILL



TYPE "L" LABORATORY STILL

This type is especially recommended for continuous operation, as required in most laboratories, and for manufacturing purposes; also for intermittent operation The Stills are substantially built of heavy copper, nickel plated All parts that come in contact with the water are thoroughly coated with pure block tin, and are most easily cleaned.

Capacities from 1 to 10 gal per hour, gas heated; electrically heated—1 to 20 gal. per hour.

Gas Heated—It is equipped with Radial Burner incased under the boiler, which reduces the heat loss to a minimum The boilers are so constructed that they present the greatest possible heating surface so that they are as near 100% efficient as is possible to make and which accounts for the great economy of fuel

Electrically Heated Those electrically heated are equipped with an immersion type G-E helical heating unit, applied by a patented method which gives 100% efficiency, so that this type of Still is very economical The heating units are so arranged in the boiler that they are surrounded with the water, thereby reducing the heat loss to a minimum The units will last indefinitely if kept covered with water, they are, however, easily replaceable in case of need This can be attended to by the operator without the necessity of returning the Still to the factory for repair This is one of the exclusive features of the Barnstead Electric Still

BARNSTEAD ALCOHOL RECOVERER

This apparatus consists of a boiler and receiver made of composition in the form of a jacket-kettle with an inlet and outlet for steam and return steam; likewise a large opening in the bottom for a draw-off valve.

BARRY-WEHMILLER MACHINERY CO.

Manufacturers of

Bottle Soaking and Pasteurizing Machinery

SAINT LOUIS, MO.

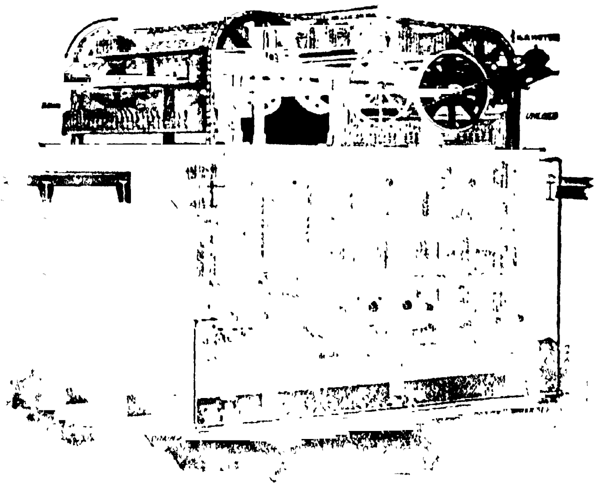
NEW YORK OFFICE
210 Fifth Ave.

PRODUCTS

Pasteurizing Machines
Bottle Soaking Machines
Bottle Cleaning Machines
Labeling Machines
"Carryall" Conveyors

PASTEURIZERS

Pasteurization as accomplished by our machine consists in gradually heating the bottles to the required temperature, maintaining it for a definite period and finally cooling the bottles in the shortest possible time to a temperature below the "danger" point. The latter feature is now recognized to be fully as important as maintaining the maximum temperature for the proper time; since the tremendously rapid multiplication of bacteria at from 95 to 110° F. demand that the liquid after passing through the maximum heat shall be cooled below these dangerous temperatures with the greatest rapidity and shall in every case be finished by the machine at not exceeding 85° F.



ONE OF OUR TYPES OF PASTEURIZING MACHINES

BRUSHING MACHINE FOR CLEANING AND POLISHING OUTSIDE OF BOTTLES BEFORE OR AFTER FILLING

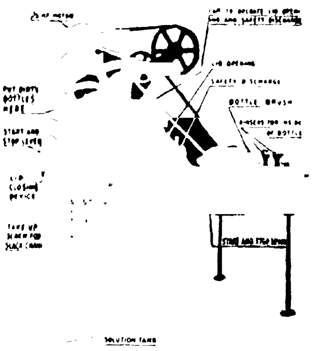
This machine equipped with device at discharge end for receiving the polished bottles and setting them up vertically in position to be removed by operator or to be deposited automatically on a chain belt carrying them to the next machine.

Built in four sizes: 10, 15, 16 and 20 bottles wide.

Will handle bottles from 6 to 32-ounce capacity—80 to 225 bottles per minute.

BOTTLE BRUSHING MACHINE

COMMON SENSE BOTTLE SOAKER



COMMON SENSE BOTTLE SOAKER

We build this machine in two general types, one type for handling pint, eight-ounce, half-pint, and quarter-pint bottles, and another type for handling quart, pint, and half-pint bottles. We build each type in three different capacities.

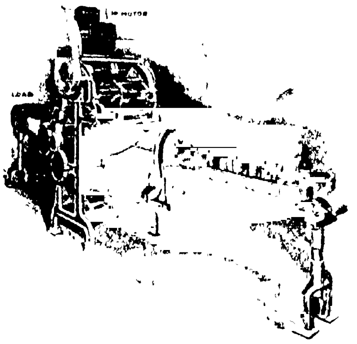
Each will handle within its own range at one time or at different times mixed lot of bottles.

Either the Soaker or the Brush can be stopped from either end of the machine and one independently from the other.

One of these machines has been in use for two years by the Mallinckrodt Chemical Co. of St. Louis, and one has been installed by Lehn & Fink in their New Jersey factory.

We also make multiple compartment soakers up to 12000 bottles hourly capacity, and eight compartments giving repeated submerging and draining of bottles, with or without automatically connected inside and outside washers with brushes or with hydro-pressure for inside cleansing.

AUTOMATIC HIGH SPEED LABELER



AUTOMATIC HIGH SPEED LABELER

Bottles from 6 to 32 oz. capacity.
Capacity from 60 to 105 bottles per minute.
Continuous Rotary motion.
Bottles placed on conveyor carrying to machine.
Bottles delivered in upright position to case packers.
No expert required to operate Machine.
Only 1/8 Horsepower actually required to operate.

THE BARTLETT HAYWARD COMPANY

Founders and Engineers

MAIN OFFICE AND WORKS
BALTIMORE, MD.

NEW YORK, N. Y.

PRODUCTS

Complete Plants for Coal and Water Gas, Coal Gas By-Products, Cane and Beet Sugar
Special Equipment for Gas and By-Product Plants
Special Gas Cleaning Apparatus
White and Middleton Gas Engines.

GAS MANUFACTURING PLANTS

We design and build complete plants for the manufacture of

Coal Gas
Carburetted Water Gas
Blue Water Gas

as well as **special equipment** for plants of any size

DeBrouwer Retort Charging and Discharging Machines
Hot Coke Conveyors
Condensers
Tar Extractors
Scrubbers
Purifier Boxes
Feld Vertical Centrifugal Scrubbers
Gas Holders
Steel Tanks
Waste Heat Boilers
Coke Screening Plants

SPECIAL GAS CLEANING APPARATUS

We design and build special apparatus for cleaning the gas from

Blast Furnaces
Gas Producers
Lime Kilns

CANE AND BEET SUGAR FACTORIES

Multiple Effect Evaporators
Vacuum Pans
Crystallizers

WHITE & MIDDLETON GAS ENGINES

Horizontal Type—5 to 50 H. P.
Vertical Type—50 H. P.

BY-PRODUCT PLANTS

We design and build complete plants for the **manufacture** of

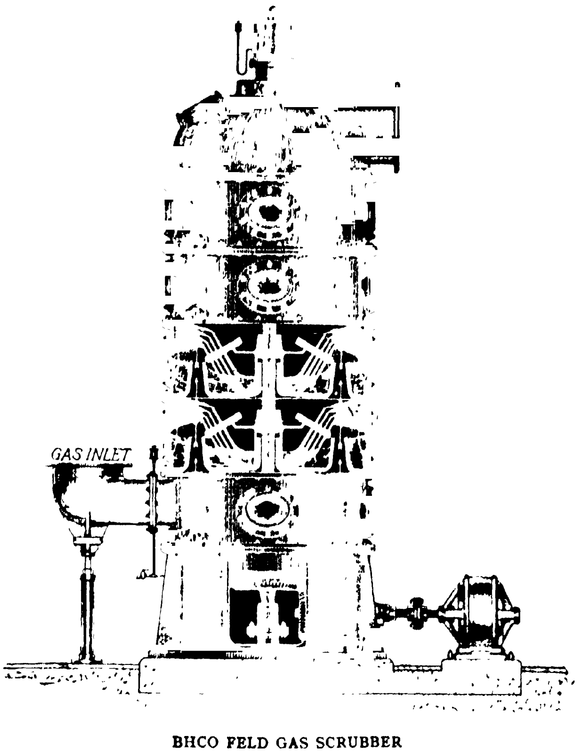
Concentrated Ammonia
Aqua Ammonia
Ammonium Sulphate

and for the **recovery** of

Tar
Cyanogen
Benzol and other products

as well as **special apparatus** for the

Production of Ammonium Sulphate without the use of Sulphuric Acid
Manufacture of Potassium Ferrocyanide and Sodium Ferrocyanide



BHCO FELD GAS SCRUBBER

BHCo-FELD GAS SCRUBBERS

For removal of dust, soluble and insoluble fumes, recovery of volatile solvents and by-products

Scrubbers are built with diameter and number of sections to suit the requirements.

BARRY-WEHMILLER MACHINERY CO.

Manufacturers of

Bottle Soaking and Pasteurizing Machinery

SAINT LOUIS, MO.

NEW YORK OFFICE
210 Fifth Ave.

PRODUCTS

- **Pasteurizing Machines**
- **Bottle Soaking Machines**
- **Bottle Cleaning Machines**
- **Labeling Machines**
- **"Carryall" Conveyors**

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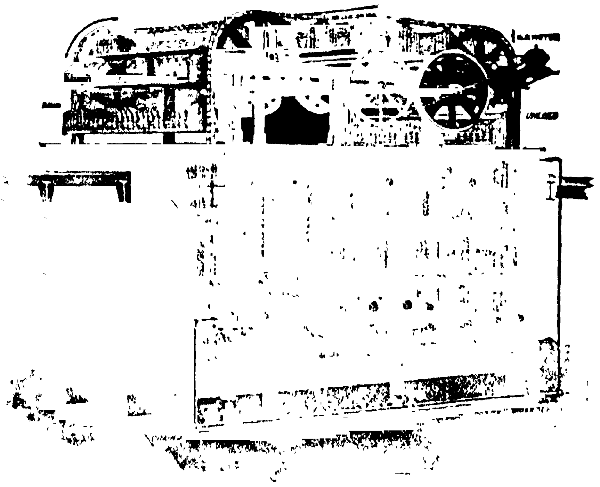


ONE OF OUR TYPES OF PASTEURIZING MACHINES

BRUSHING MACHINE FOR CLEANING AND POLISHING OUTSIDE OF BOTTLES BEFORE OR AFTER FILLING

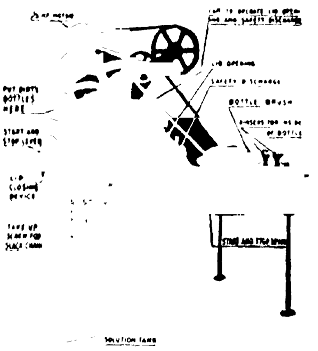
This machine equipped with device at discharge end for receiving the polished bottles and setting them up vertically in position to be removed by operator or to be deposited automatically on a chain belt carrying them to the next machine.

Built in four sizes: 10, 15, 16 and 20 bottles wide.

Will handle bottles from 6 to 32-ounce capacity—80 to 225 bottles per minute.

BOTTLE BRUSHING MACHINE

COMMON SENSE BOTTLE SOAKER



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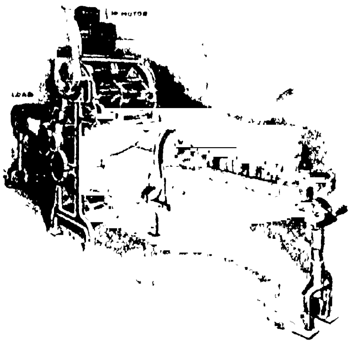
Either the Soaker or the Brush can be stopped from either end of the machine and one independently from the other.

One of these machines has been in use for two years by the Mallinckrodt Chemical Co. of St. Louis, and one has been installed by Lehn & Fink in their New Jersey factory.

We also make multiple compartment soakers up to 12000 bottles hourly capacity, and eight compartments giving repeated submerging and draining of bottles, with or without automatically connected inside and outside washers with brushes or with hydro-pressure for inside cleansing.

AUTOMATIC HIGH SPEED LABELER



AUTOMATIC HIGH SPEED LABELER

Bottles from 6 to 32 oz. capacity.

Capacity from 60 to 105 bottles per minute.

Continuous Rotary motion.

Bottles placed on conveyor carrying to machine.

Bottles delivered in upright position to case packers.

No expert required to operate Machine.

Only ⅛ Horsepower actually required to operate.

BAYLEY MANUFACTURING COMPANY

Builders of Heating, Ventilating and Drying Apparatus

CHICAGO OFFICE:
1156 First National Bank Building

732 Greenbush St.
MILWAUKEE, WIS.

CLEVELAND OFFICE:
826 Engineers Building

PRODUCTS

Plexiform Fans, Pressure Blowers, Fans for Forced and Induced Draft, Chinook Heaters, Steam Engines, Leather Driers, Shavings Exhaust Fans, Steam Traps, Blast Gates, Counter Shafts, Special Equipment for Handling Fumes in Chemical Plants.

Literature on all these Bayley products will be supplied on request

SERVICE

The Bayley Mfg. Co. has built Fans and Blowers for handling acid fumes for many of the largest plants in America, and its engineering staff is at all times prepared to submit plans and estimates for efficient equipment adapted to individual requirements

PLEXIFORM FANS

The Plexiform Fan is of a distinctive and original design that combines great strength in construction with lightness and efficiency. Its characteristics and distinguishing features are:

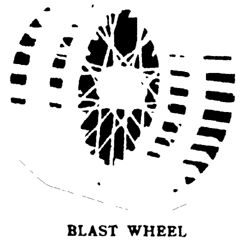
Maximum air from minimum of housing.

Large and practically unobstructed inlet and outlet openings.

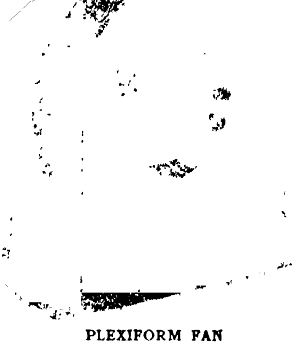
Free and noiseless delivery of air, without the use of arbitrary cut-offs.

A type of construction adapted for handling high temperature as well as low temperature gases and for double width, double inlet fans as well as single width, single inlet fans.

Suitable for practically all applications where maximum volume of air (at low or medium pressures) is desired, and especially where space conditions limit and where horsepower expenditure is a prime factor.



BLAST WHEEL
FOR PLEXIFORM FAN



PLEXIFORM FAN

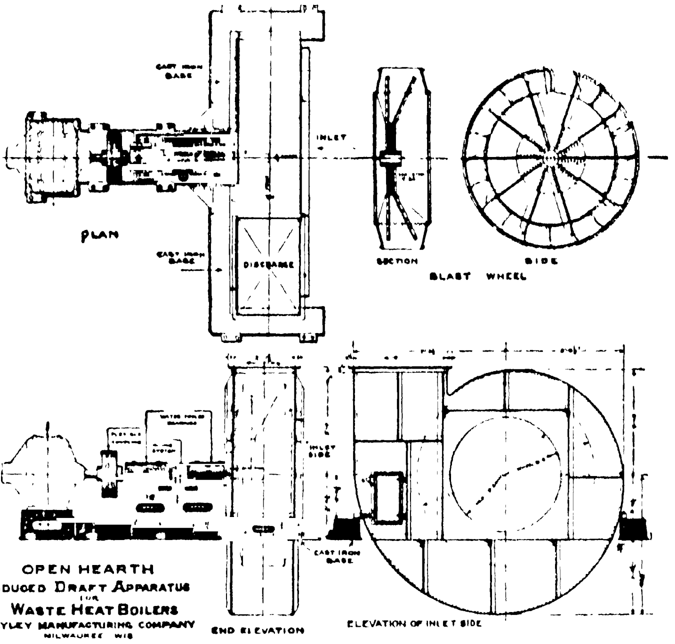
It is used generally as a component part of indirect systems of heating and ventilating for industrial buildings of all kinds; for forced and induced draft applications; for drying; for ventilating purposes, and for the handling of dust-ladened air, etc.

STEAM ENGINES

Vertical and horizontal steam engines for high and low pressures, built for direct connection to fans and generators and for belt connections.

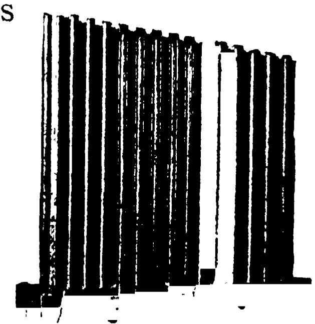
EXHAUST FANS FOR INDUCED DRAFT

This figure illustrates a specially constructed steel plate exhaust fan built for induced draft purposes.



This is for handling large volumes of high temperature gases against high pressures. The fan is direct driven by an electric motor, through a flexible coupling. The blast wheel is overhung, the journals being on one side, the motor, the journals and the fan to be erected on a common sub-base making a self-contained unit.

CHINOOK HEATERS



CHINOOK HEATER

A staggered tube, indirect heater, built without the use of return bends, elbows, nipples or left-hand threads. The circulation is accomplished by the use of a pipe within a pipe. The Chinook heater cannot be racked out of shape by the ravages of unequal expansion and contraction, as each tube is independent of every other.

It is used principally in connection with the Plexiform Fan for heating and ventilating public buildings and for drying. It is also used as indirect radiation independent of fans, for cooling water and for condensing exhaust steam.

It is shipped set up or knocked down, depending on size and installation conditions.

BARRY-WEHMILLER MACHINERY CO.

Manufacturers of

Bottle Soaking and Pasteurizing Machinery

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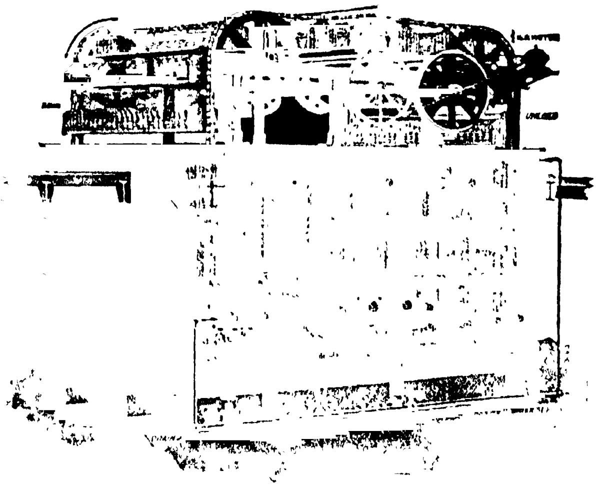
210 Fifth Ave.

PRODUCTS

Pasteurizing Machines
Bottle Soaking Machines
Bottle Cleaning Machines
Labeling Machines
"Carryall" Conveyors

PASTEURIZERS

Pasteurization as accomplished by our machine consists in gradually heating the bottles to the required temperature, maintaining it for a definite period and finally cooling the bottles in the shortest possible time to a temperature below the "danger" point. The latter feature is now recognized to be fully as important as maintaining the maximum temperature for the proper time; since the tremendously rapid multiplication of bacteria at from 95 to 110° F. demand that the liquid after passing through the maximum heat shall be cooled below these dangerous temperatures with the greatest rapidity and shall in every case be finished by the machine at not exceeding 85° F.



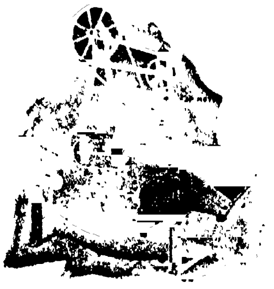
ONE OF OUR TYPES OF PASTEURIZING MACHINES

BRUSHING MACHINE FOR CLEANING AND POLISHING OUTSIDE OF BOTTLES BEFORE OR AFTER FILLING

This machine equipped with device at discharge end for receiving the polished bottles and setting them up vertically in position to be removed by operator or to be deposited automatically on a chain belt carrying them to the next machine.

Built in four sizes: 10, 15, 16 and 20 bottles wide.

Will handle bottles from 6 to 32-ounce capacity—80 to 225 bottles per minute.

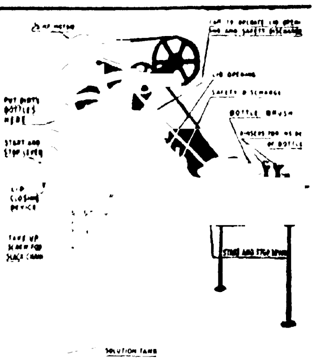


BOTTLE BRUSHING MACHINE

COMMON SENSE BOTTLE SOAKER

We build this machine in two general types, one type for handling pint, eight-ounce, half-pint, and quarter-pint bottles, and another type for handling quart, pint, and half-pint bottles. We build each type in three different capacities.

Each will handle within its own range at one time or at different times mixed lot of bottles.



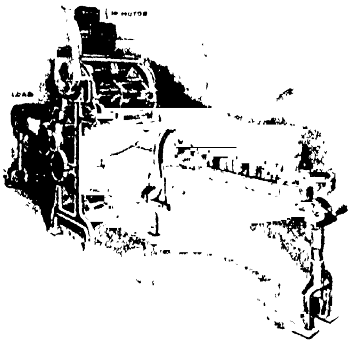
COMMON SENSE BOTTLE SOAKER

Either the Soaker or the Brush can be stopped from either end of the machine and one independently from the other.

One of these machines has been in use for two years by the Mallinckrodt Chemical Co. of St. Louis, and one has been installed by Lehn & Fink in their New Jersey factory.

We also make multiple compartment soakers up to 12000 bottles hourly capacity, and eight compartments giving repeated submerging and draining of bottles, with or without automatically connected inside and outside washers with brushes or with hydro-pressure for inside cleansing.

AUTOMATIC HIGH SPEED LABELER



AUTOMATIC HIGH SPEED LABELER

Bottles from 6 to 32 oz. capacity.

Capacity from 60 to 105 bottles per minute.

Continuous Rotary motion.

Bottles placed on conveyor carrying to machine.

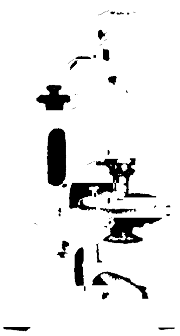
Bottles delivered in upright position to case packers.

No expert required to operate Machine.

Only ⅛ Horsepower actually required to operate.

fractive index is read directly from the graduated circle. The accuracy of reading is to about 2 units in the fourth decimal place. When white light is employed, the dispersion is neutralized by the Abbe Compensator, the mount of which is graduated, permitting measurements of mean dispersion.

CHEMICAL MICROSCOPE M

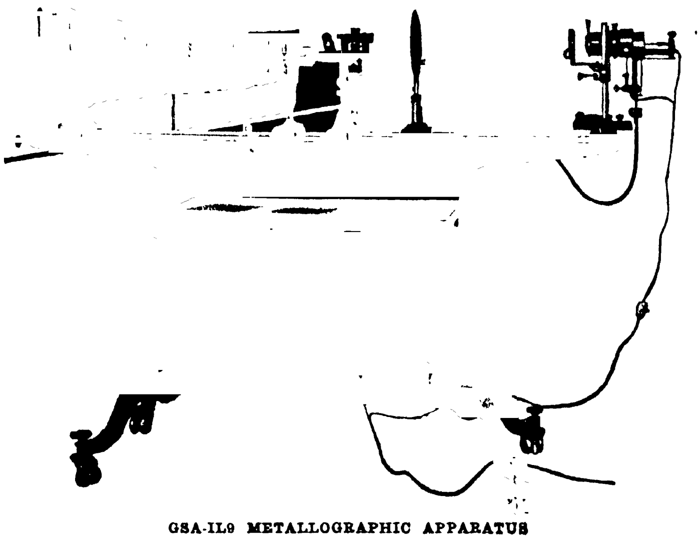

CHEMICAL MICROSCOPE M

This microscope is made after the design of Dr. E. M. Chamot, of the Department of Chemistry at Cornell University and author of "Elementary Chemical Microscopy." It is admirably adapted for the examination of foods and drugs, as well as chemicals; also, by the addition of an auxiliary stage, for a limited amount of metallurgical work. The complete outfit, with three objectives, affords a magnification of from 20 to 250 diameters. Write for descriptive circular.

METALLOGRAPHIC EQUIPMENT

While chemical analysis determines the chemical composition of a metal, it is only by the use of the microscope that the physical composition is determined. The microscope is the means of an absolute check on alloys; it can be used for observing changes in the physical composition brought about by variation in the kind and quantity of ingredients used in the manufacture, by heat treatment, rolling, strain, age and the like, all of which changes can be permanently recorded by means of metallographic apparatus.

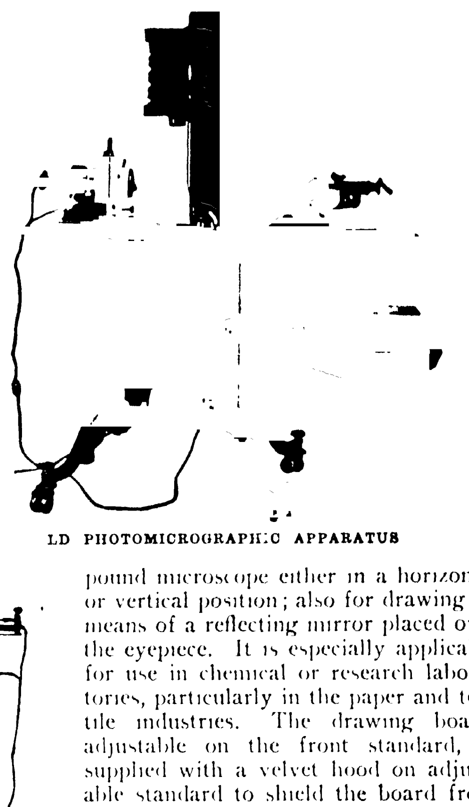
Bausch & Lomb outfits are extremely rigid and have ample range of adjustment, making them very convenient to handle. The optical equipment is of the highest standard, illumination is under perfect control and the results obtained are clear and sharp. We have a model to fit the needs of every metallurgist.


GSA-IL9 METALLOGRAPHIC APPARATUS

The GSA-IL9 equipment, as illustrated, is recommended to those who wish to obtain an apparatus of unusual rigidity and mechanical accuracy, particularly where high magnifications are to be undertaken. While it is regularly provided with a floor stand, it can be supplied with the bed fitted with short, flat supports, for attaching to a laboratory table or embedding in a cement foundation, if such is desired. The complete equipment consists of the following: a cast iron supporting stand, of massive construction, with base spread of 54 x 24 in. and height of 42 in.; illuminating system with 5-ampere, 90°, hand feed arc lamp and rheostat for 110 volts, camera, which will accommodate plates up to 8 x 10-in., provided with all necessary accessories, and IL inverted microscope, especially designed for use in this equipment.

APPARATUS FOR PHOTOMICROGRAPHY

The LD camera, as illustrated, is so arranged that it may be used for photomicrography with transmitted light, using the regular laboratory or compound microscope either in a horizontal or vertical position; also for drawing by means of a reflecting mirror placed over the eyepiece. It is especially applicable for use in chemical or research laboratories, particularly in the paper and textile industries. The drawing board, adjustable on the front standard, is supplied with a velvet hood on adjustable standard to shield the board from light, when desired.


LD PHOTOMICROGRAPHIC APPARATUS

Supporting stand is of rigid construction, 39 in. high; illuminating system consists either of a 5-ampere, 90°, hand feed arc lamp with rheostat for 110 volts and aspheric condenser or a 6-volt Mazda lamp and transformer for 110 volts, A. C.; camera, fully equipped, will accommodate plates up to 5 x 7-in.

Write for literature or further information concerning our metallographic or photomicrographic outfits.

BEACH-RUSS COMPANY

GENERAL OFFICES
HUDSON TERMINAL BUILDING
50F CHURCH STREET, NEW YORK, N. Y.
Chicago Philadelphia
Telephones CORTLANDT 54 55 56
FACTORY Brooklyn, N. Y. Cable Address "ABBEACHT", New York

PRODUCTS

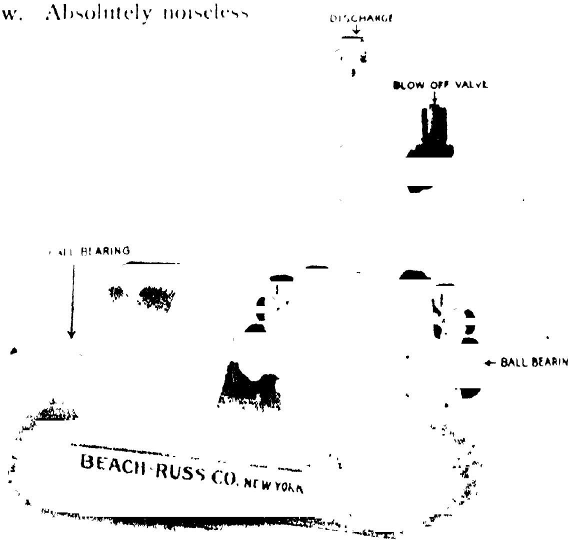
Rotary Air Compressors
Vacuum Pumps
Acid-Resisting Pumps
Heavy Liquid Pumps
High Vacuum Finishing Pumps
Also Positive Pressure Blowers, Pumps for Heating Plants, and Filter Presses.

See Announcement in this volume of Abbe Engineering Company for:

Pulverizing Mills
Rotary Cutters
Disintegrators

ROTARY AIR COMPRESSORS (Patented)

These compressors are for all purposes requiring air pressure—gas and oil furnaces, agitating liquids, atomizing, glass blowing, laundries, etc. They give a direct, non-pulsating supply of air without the use of air receivers of any kind up to 25 lbs pressure. They have no complicated parts and are equipped with ball bearings throughout, making their power consumption low. Absolutely noiseless



ROTARY AIR COMPRESSOR
Patented

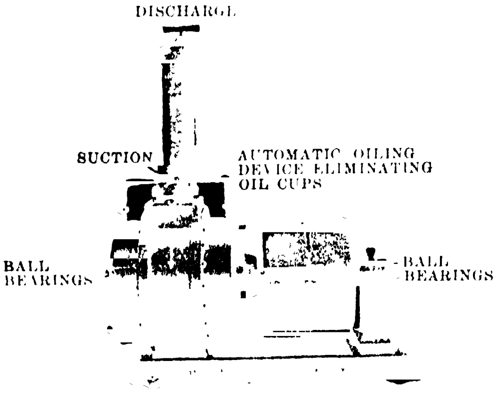
SIZES AND CAPACITIES

Size No.	Speed R.P.M	Capacity Cu Ft P.M.	H. P. at 5 lb. Press.	Pipe Size	Pulleys Inches	Weight Pounds	Floor Space Required
1	600	6	1/4	3/4	6 x 1	30	1' 3" x 6"
1 1/2	600	9	1/2	3/4	6 x 1	40	1' 4" x 6"
2	600	15	3/4	3/4	6 x 2	50	1' 6" x 6"
3	400	28	1 1/4	1	8 x 2	100	2' 0" x 10"
4	400	45	2	1 1/4	8 x 2	125	2' 2" x 10"
5	350	63	3	1 1/2	12 x 3	275	2' 6" x 1' 3"
6	350	87	3 1/4	1 1/2	12 x 4	350	2' 8" x 1' 3"
7	300	114	5	2	16 x 4	600	4' 1" x 1' 6"
8	300	175	7	2	16 x 6	800	4' 5" x 1' 6"
9	300	263	8	4	18 x 6	1100	5' 0" x 1' 6"
10	250	500	15	8	20 x 8	2000	5' 6" x 2'10"
11	225	730	30	10	22 x 8	2808	6' 0" x 3' 0"
12	200	1000	25	12	24 x 10	4000	8' 0" x 3' 2"

SINGLE STAGE VACUUM PUMPS (Patented)

These pumps may be used for all purposes where a vacuum up to 29 in. (735 mm.) is required. They are built in the same capacities as the Beach-Russ rotary air compressors, and run noiselessly.

These pumps cost less than the Beach-Russ compound high duty vacuum pumps, but they equal the latter in construction, material and workmanship.



SINGLE STAGE VACUUM PUMP
Patented

SIZES AND CAPACITY OF SINGLE VACUUM PUMPS

Size No	Cu Ft P M	Speed R P M	H P Motor Vacuum 15"	H P Motor Vacuum 27"	Outlet Inches	Size of Pulleys	Weight Pounds	Floor Space Required
1	6	600	1/4	1/2	3/4	6 x 2	50	1' 3" x 6"
2	15	600	1	1 1/2	3/4	6 x 3	75	1' 6" x 6"
3	28	400	1 1/2	2 1/2	1	10 x 3	150	2' 0" x 10"
4	45	400	2	3	1 1/4	10 x 4	200	2' 2" x 10"
5	63	350	3	5	1 1/2	12 x 4	400	2' 6" x 1' 3"
6	75	300	3 1/2	5 1/2	1 1/2	16 x 4	450	2' 8" x 1' 3"
7	114	300	6	9	2	16 x 6	655	4' 1" x 1' 6"
8	175	300	7	11	2 1/2	18 x 6	1100	4' 5" x 1' 6"
9	263	300	8	12	6	18 x 8	1500	5' 0" x 1' 6"
10	500	250	15	30	8	22 x 8	2500	5' 6" x 2'10"
11	730	225	20	35	10	24 x 10	3200	6' 0" x 3' 0"
12	1000	200	25	50	12	30 x 12	4000	8' 0" x 3' 2"

COMPOUND HIGH DUTY VACUUM PUMPS

(Guaranteed to exhaust to within 1/10 in. (2.5 mm.) of Barometer.

The Beach-Russ Company has been manufacturing patented rotary vacuum pumps for twenty-four years.

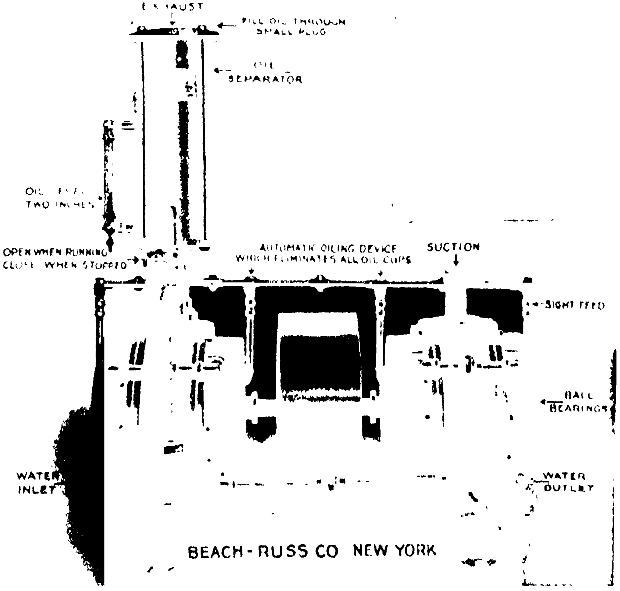
These pumps were awarded the gold medal at the Panama-Pacific Exposition. They are simple in construction and silent in operation, have no gears or complicated parts, take up little room and have low power consumption per unit volume of air displaced.

Uses—These pumps can be used to advantage in distilling, incandescent lamp exhausting, preserved food sealing, vacuum bottle manufacturing, vacuum heating, liquid transferring and many other operations. They are especially useful in laboratories.

The High Vacuum Pump mentioned above is not only obtainable in the small volume laboratory pumps, but also in large commercial sizes displacing hundreds of cubic feet of air per minute.

Continued on Next Page

Lubrication—These pumps are equipped with the Beach-Russ patented automatic oiling device, by means of which oil cups are eliminated and perfect lubrication of all parts is secured. Ball bearings are used throughout. Simple in construction, silent in operation


EXHAUST
FILL OIL THROUGH SMALL PLUG
OIL SEPARATOR
OIL LEVEL TWO INCHES
OPEN WHEN RUNNING CLOSE WHEN STOPPED
AUTOMATIC OILING DEVICE WHICH ELIMINATES ALL OIL CUPS
SUCTION
SIGHT FEED
BALL BEARINGS
WATER INLET
WATER OUTLET
BEACH-RUSS CO NEW YORK

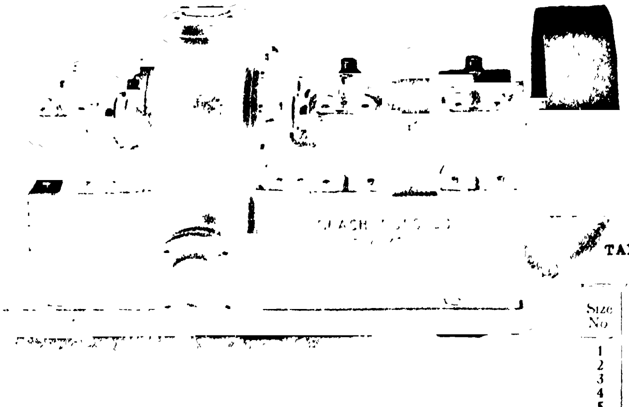
COMPOUND HIGH VACUUM PUMP
Patented
Guaranteed to produce a Vacuum within 1/10 inch of Barometer

SIZE AND CAPACITY OF COMPOUND HIGH VACUUM PUMPS WE ALSO MANUFACTURE LARGER SIZES

Size No	Capacity Cu Ft P M	Speed R P M	Outlet Inches	Weight Pounds	Horse Power	Pulleys Inches	Floor Space Required
1	6	600	¾	175	¾	8 x 2	1′ 8″ x 10″
2	9	600	¾	200	1	8 x 2	1′ 9″ x 10″
3	15	600	¾	225	1½	8 x 2	2′ 0″ x 10″
4	28	400	1	375	2½	10 x 3	2′ 8″ x 1′ 3″
5	45	400	1¼	425	3	10 x 3	2′ 10″ x 1′ 3″
6	63	250	1½	900	5	16 x 6	3′ 3″ x 1′ 9″
7	87	250	2	1100	5½	16 x 6	3′ 6″ x 1′ 9″
8	114	200	2½	1700	9	18 x 6	5′ 4″ x 2′ 2″
9	175	200	3	2300	13	18 x 6	7′ 0″ x 2′ 0″
10	263	200	6	3250	18	18 x 8	8′ 6″ x 2′ 0″

HEAVY LIQUID PUMPS

These pumps are designed for pumping coal tar products, oil greases, paints, varnish and other liquid of high viscosity.

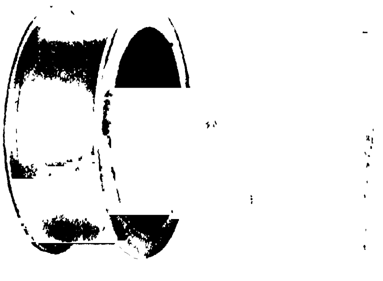


HEAVY LIQUID PUMP

They are of extra heavy construction and will stand all kinds of abuse.

They are built in five sizes with capacities from 50 to 500 gal. per minute.

BRONZE GEAR PUMP



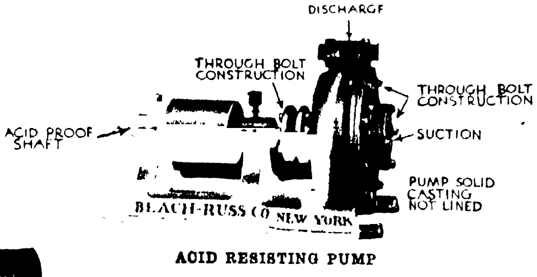
BRONZE GEAR PUMP

For pumping all kinds of liquids; Capacities 1 gallon to 50 gallons per minute up to 80 lbs pressure or 170 foot head

ACID RESISTING PUMPS

Our Acid Resisting Centrifugal pumps are constructed in hard lead, antimony alloy, monel metal, bronze and aluminum to suit various kinds of work. They are cast solid, not lined, making their period of service unlimited. Single Stage, Side Suction, open impeller type with through bolt construction which eliminates all chance of stripping threads by careless workmen

These Pumps were designed in conjunction with the Government engineers for pumping both diluted and heavy solutions of sulphuric acid


DISCHARGE
THROUGH BOLT CONSTRUCTION
THROUGH BOLT CONSTRUCTION
ACID PROOF SHAFT
SUCTION
PUMP SOLID CASTING NOT LINED
BEACH-RUSS CO NEW YORK

ACID RESISTING PUMP

The dimensions mentioned in the table below can also be obtained in brass, bronze or cast iron. We have manufactured acid resisting pumps for a number of years and our experience in this line enables us to offer the best pump of its kind on the market.

TABLE OF BELT DRIVEN, ACID-RESISTING CENTRIFUGAL PUMPS

Size No	Section	Discharge	Cap., Gals Per Min	Pulley	Floor Space	Shipping Weight
1	1¼″	1¼″	20	4 x 3″	12 x 10	40
2	2″	1½″	45	5 x 5″	21 x 13	100
3	3″	2″	90	6 x 6″	24 x 17	200
4	3″	2½″	150	6 x 7″	26 x 20	290
5	4″	3″	200	7 x 7″	28 x 24	400

CHRISTIAN BECKER, INC.
TORSION BALANCE COMPANY

MAIN OFFICE
92 READE STREET, NEW YORK, N. Y.
FACTORY 147-153 Eighth Street, Jersey City, N. J.
BRANCH OFFICES
Chicago, Ill. 31 W. Lake Street
San Francisco, Cal. 49 California Street

PRODUCTS

Balances: Analytical, Assay, Bullion, Jewelers, etc.

Scales: Laboratory, Pharmaceutical, Textile, Cream-Test, Grain, etc.

Weights: Metric, Avoirdupois, Troy.

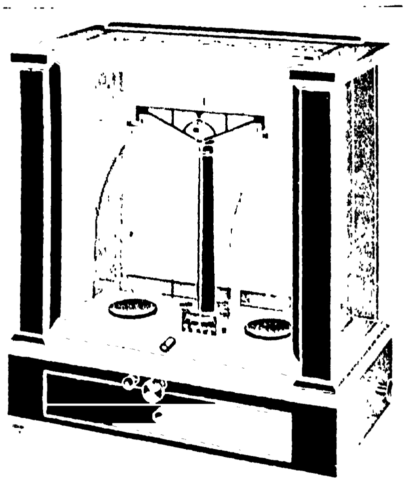
ANALYTICAL "CHAINOMATIC" BALANCES

Riders and fractional weights up to 50 mg. eliminated.

Weighing in analytical chemistry completely revolutionized.

Thousands in use.

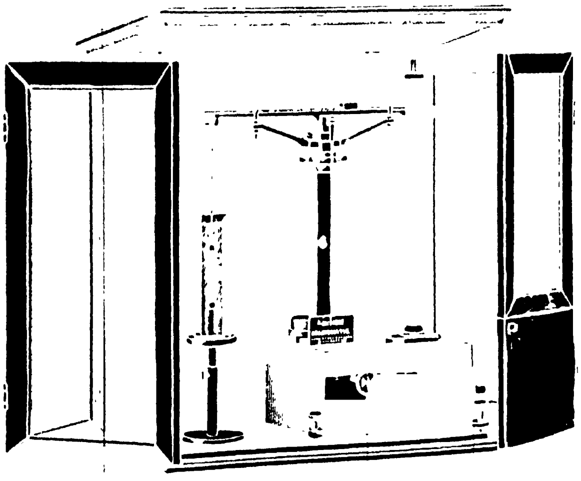
Endorsed by industrial chemists and educational workers everywhere.



ANALYTICAL CHAINOMATIC BALANCE NO. 8-A

Direct readings are taken from the graduated scale and vernier, in itself a great time-saving feature, and reducing errors to a minimum, when compared with the customary method of using small fractional weights, etc.

HAINOMATIC
Trade-Mark



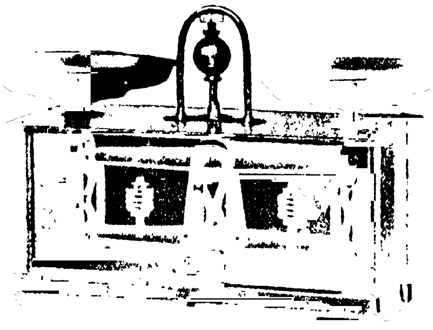
SPECIFIC GRAVITY CHAINOMATIC BALANCE FOR LIQUIDS

Graduated Scale Giving Direct Readings in Specific Gravity
Simple, Rapid, Accurate, Scientific
Automatic in Principle. No Weights or Riders

No. 100 ranging to 2.0000, to fourth decimal place.

No. 103 ranging to 3.500, to third decimal place.

Supplied to U. S. and Canadian Governments, industrial chemists, colleges, etc.



TORSION LABORATORY BALANCE NO. 255

The accepted standard for laboratory work.

Capacity	4½ kg	(10 lb.)
Sensitiveness	1/15 gram	(1 grain)
Pans	8" diameter	

Equipped with or without graduated slide beam, metric or avoirdupois.

BECKLEY PERFORATING COMPANY

202 North Avenue

GARWOOD, N. J.

PRODUCTS

Perforated Metal of all kinds, for all purposes, for Chemical Plants, Centrifugal Linings, Phosphate Mines, Fertilizer Plants, Sand, Gravel, Coal and Coke Screens, Ore and Shaker Screens, Strainers, Stamp Batteries, Oil and Gas Stoves, Cotton Seed Oil Mills, etc.

Steel Tanks, Electrically Welded; Tanks with Lead and other linings; Tanks of any metal; Open Type, Pressure, Storage, Chemical, Air, Mixing, Dissolving, Jacketed and Special Tanks for Special Purposes.

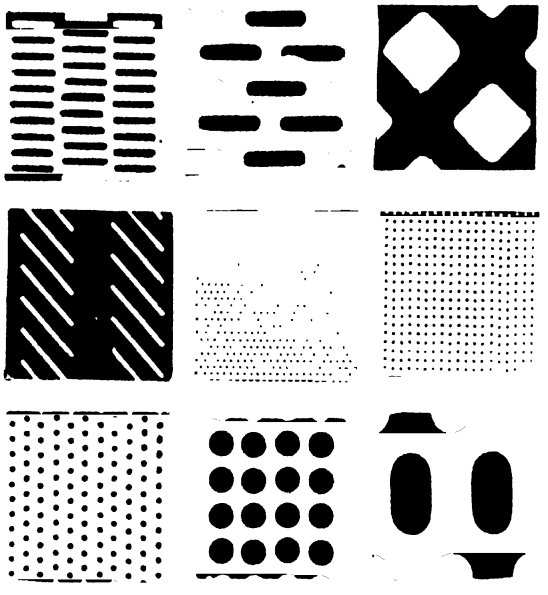
Stacks; Elbows; Chutes; Pans; Cylinders, etc.

Special Sheet Metal Work.

PERFORATED METAL

Our Perforated Metal is suitable for all industrial chemical and metallurgical purposes. We are equipped to perforate metal with perforations as small as .020 and we have varieties suitable for use in chemical plants, ore and shaker screens, strainers, filters, stamp batteries, mining and smelting works, silver reduction, sugar refineries, etc.

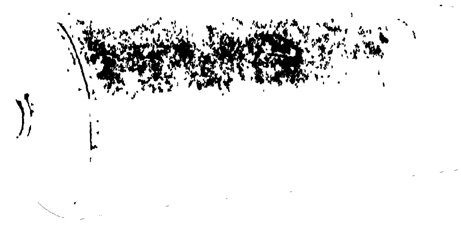
We shall be pleased to quote on your requirements for perforated metal and feel sure that from the many perforations we have to offer you can find something that will solve your screening or separating needs.



A FEW OF THE MANY TYPES OF PERFORATED METAL WE SUPPLY

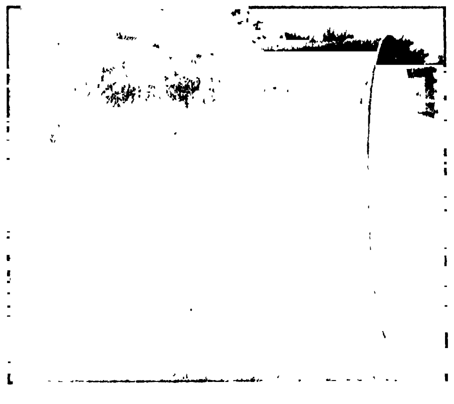
TANKS

We manufacture all types of square and rectangular tanks. Round tanks up to 10' diameter, 40' in length. They are electrically welded and constructed in accordance with recognized up-to-date standards.



ELECTRICALLY WELDED PRESSURE TANK

The majority of our tanks have been furnished to the chemical industries and are giving satisfactory service. Many furnished where oil or gas tight conditions are absolutely imperative.



TANK FOR OIL STORAGE

PANS

We manufacture many types. Crystallizing, dyeing, lathe drip and shop pans.

PRICES

Our prices will be found as low as is consistent with first class workmanship, which we make our first consideration in all cases.

Send us your specifications or blueprints and we shall be pleased to quote on your requirements. We can refer you to many satisfied users of equipment furnished to the chemical industries.

BELMONT PACKING AND RUBBER CO.

PHILADELPHIA, PA.

BRANCHES

New York Chicago

AGENCIES IN ALL PRINCIPAL CITIES

PRODUCTS

Packings for every purpose; Flax, Hemp, Rubber, Asbestos, Cotton, Paper Fiber, and Metallic.

Gaskets; Asbestos, Rubber, Copper, Compressed Sheet and Paper Fiber.

Rubber Hose for every purpose.

Rubber Belting for Transmission, Elevating and Conveying.

Rubber Pump Valves.

Regular and Special items in rubber.

Acid Resisting Rubber Boots.

ORGANIZATION

It would not be possible in this limited space to clearly outline the comprehensiveness of our manufacturing efforts nor the completeness of our organization. For this reason we suggest the requesting of our General Catalog in which packings for all conditions are illustrated and described.

FACTORY, FRANKFORD JUNCTION, PHILADELPHIA

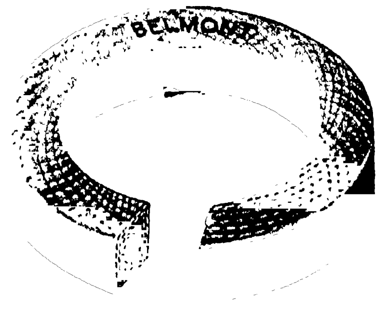
Flax and Hemp are received in their raw state direct from the primary markets. Hackling, carding, spinning, braiding and lubricating are done entirely in our own plant with the most modern equipment.

Asbestos is received from the Canadian Mines and is crushed, carded, spun and woven, braided or twisted into its final form.

CONSULTATION

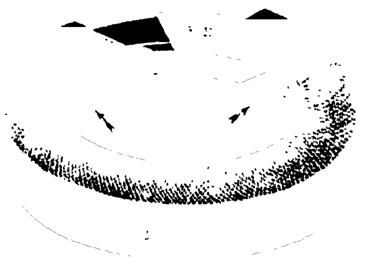
Our General Catalog is one of the most complete issued covering packings for a wide variety of services—one will be cheerfully furnished upon request. However, our catalog does not cover our entire manufacturing efforts as we are often called upon to evolve special constructions to meet unusual conditions. The work of recommending is done by packing specialists in our own organization who with years of practical experience view the situation from the engineer's standpoint. The service of recommending and of submitting samples is gratis and involves no obligation to follow the suggestions. Consult us.

BELMONT ASBESTOS GASKETS STYLE 606



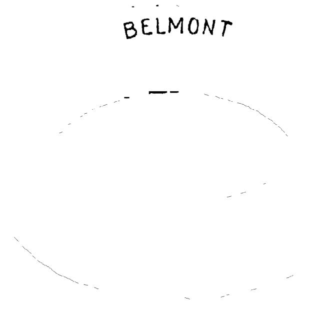
BELMONT STYLE 19 HOLLOW CENTER PACKING

The hollow center offers a point of least resistance and compensates for all changes of expansion and contraction due to changes of pressures and resulting temperatures. Booklet 19 explains this packing fully.



BELMONT STYLE 1 EXPANSION PACKING

For steam, ammonia and hot water. Write for booklet "A."



BELMONT STYLE 751 BRAIDED ASBESTOS STEAM PACKING

For superheated and high pressure steam, air compressor rods, high speed engines, expansion joints, locomotive air pumps and throttles. Write for booklet "B."

BENJAMIN ELECTRIC MFG. CO.

SALES AND DISTRIBUTING OFFICES

CHICAGO

NEW YORK

SAN FRANCISCO

Benjamin Electric Mfg Co of Canada, Ltd
Montreal—Toronto—Winnipeg

BENJAMIN
Makers of Things More Useful

The Benjamin Electric, Ltd.,
London, England

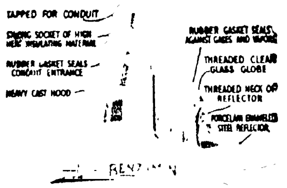
FACTORIES Chicago and Desplaines, Ill

PRODUCTS

- Benjamin Industrial Lighting
- Acid Proof Lighting Fixtures
- Gas and Vapor Proof Lighting Fixtures
- Weatherproof Lighting Apparatus
- Marine Lighting and Signaling Apparatus
- Store and Office Lighting Fixtures
- Porcelain Enameled Reflectors and Specialties
- Industrial Signals
- Panel Boards and Cabinets
- Wiring Devices
- Electrical Specialties
- Two-way Plugs
- Automobile Specialties
- Punch Press Safety Devices
- Drawings, Stampings, and Spinnings in Sheet Metal
- Consulting and Engineering Service

BENJAMIN GAS AND VAPOR PROOF FIXTURES

Chemical works, powder mills, and varnish and paint factories represent a group which has its own lighting problem. Corrosion and damage from acids, fumes and gases must be considered. Danger to employees from explosion and ignition through contact of gases, dust and vapors with the hot lamps or other portions of the lighting unit demands the installation of gas and vapor proof equipment.

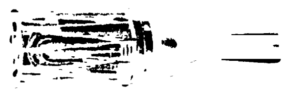

TAPPED FOR CONDUIT
SWING SOCKET OF HIGH HEAT INSULATING MATERIAL
RUBBER GASKET SEALS CONDUIT ENTRANCE
HEAVY CAST HOOD
RUBBER GASKET SEALS AGAINST GASES AND VAPORS
THREADED CLEAR GLASS GLOBE
THREADED NECK OF REFLECTOR
PORCELAIN ENAMELED STEEL REFLECTOR

SECTION SHOWING CONSTRUCTION OF HOOD ON HEAVY DUTY GAS AND VAPOR PROOF FIXTURES

HEAVY DUTY GAS AND VAPOR PROOF FIXTURE WITH DOME REFLECTOP

Benjamin Heavy Duty Gas and Vapor Proof Fixtures are units of unusual rugged construction for use in all industries or places where inflammable matter is handled, or dust and dangerous gases and vapors are present in the atmosphere. They will stand up under the most rigorous conditions and are an insurance against loss by fire or explosion wherever hazardous atmospheric conditions prevail. A special cast hood supports socket reflector and heavy screw globe which tightly encloses the lamp. Furnished with Dome, Bowl or Symmetrical Angle reflector, in four sizes for lamps from 75 to 500 watts.

GAS AND VAPOR PROOF HAND PORTABLE



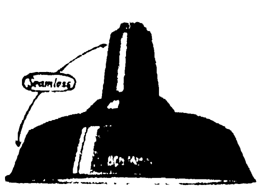
GAS AND VAPOR PROOF HAND PORTABLE

This portable light is convenient for use in the presence of gases and vapors. Consists of wooden handle with stuffing gland and porcelain receptacle, and 6 inch, 25 to 60 watt tubular lamp tightly enclosed in heavy screw globe, protected by removable metal guard with hinged hook.

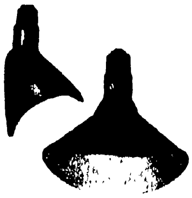
ENGINEERING SERVICE

The Benjamin Company maintains an Illuminating Engineering service for the purpose of giving practical advice regarding lighting problems.

BENJAMIN GENERAL LIGHTING



SEAMLESS DOME REFLECTOR SOCKET



ELLIPTICAL ANGLE REFLECTOR

The Benjamin Company specializes in reflectors and fixtures for industrial lighting. Each unit has been designed and perfected to meet specific requirements of lighting in industrial plants. Benjamin Lighting saves its cost in a few months—then pays big dividends.

BENJAMIN MOISTURE AND DUST PROOF FIXTURES

MOISTURE AND DUST PROOF FIXTURE

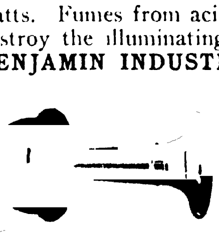
These fixtures are for use in refrigerating plants, engine rooms, plating rooms, etc., and other places where it is desirable to protect the lamp and live electrical parts from deposits of moisture, dust and dirt. A copper or aluminum hood supports socket and heavy clear screw globe. Furnished in three sizes for lamps from 25 to 100 watts.

BENJAMIN ACID RESISTING FIXTURE

ACID RESISTING FIXTURE

This fixture is for use in acid plants, electroplating shops, pickling rooms, powder plants, oil refineries, paint shops and places where lighting equipment must be protected from corrosive acids, explosive fumes, or moisture. A special lead alloy or aluminum cement coated hood supports socket and clear Holophane prismatic globe. Furnished in two sizes for lamps from 75 to 150 watts. Fumes from acids and corrosive gases cannot destroy the illuminating efficiency of this unit.

BENJAMIN INDUSTRIAL SIGNALS



WEATHERPROOF INDUSTRIAL SIGNAL HORN

For Calls, Warnings and Fire Alarms the Benjamin Industrial Signals are more effective than bells and gongs. Their powerful, far-reaching tone with a distinctive tone pitch can be heard above the din of machinery and other noises.

INQUIRIES

Inquiries relative to any class of Benjamin Products are invited. Catalogs covering our lines are available for distribution.

A. BERRY COPPER WORKS

Copper Equipment for All Industries

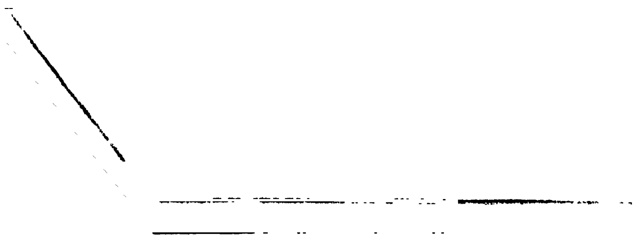
249 WEST BROADWAY, NEW YORK, N. Y.

PRODUCTS

Chemical Apparatus of Copper

- **Tanks**
- **Stills**
- **Heating Coils**
- **Cooling Coils**
- **Vacuum Pans**
- **Steam Jacketed Kettles**
- **Mixing Kettles**
- **Solvent Recovery Apparatus**
- **Tin and Lead Lined Apparatus**

We make a specialty of repairs to copper work



COPPER DYE PANS

The above pans are made in all sizes

EXPERIENCE

We have been building special industrial equipment of copper for many years. We have experienced coppersmiths with every facility at hand for giving our clients the highest results in workmanship at a minimum cost.

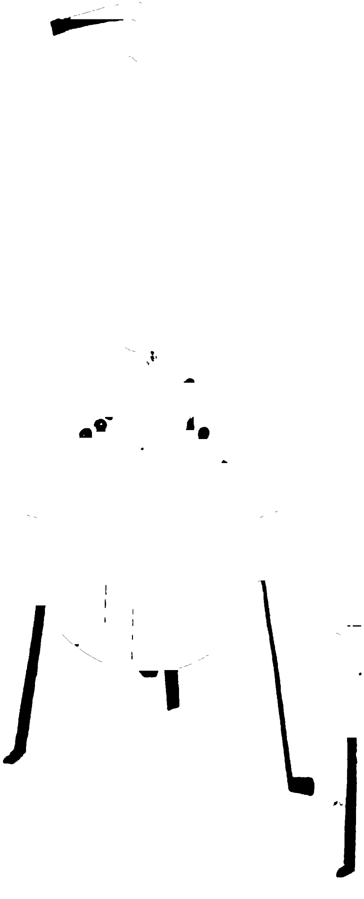
SPECIAL EQUIPMENT

When a company is designing copper equipment with an entirely new idea involved, they should submit the design to a competent coppersmithing firm, who will advise them whether the equipment will be mechanically strong, economical to operate, etc. We have done a great deal of this class of work, and have met many difficult specifications.

DISTILLING APPARATUS

Illustration shows a refining still of copper. We build all types of distilling apparatus, continuous or periodic, to operate either under a vacuum or at atmospheric pressure, to handle almost any volatile liquid, and constructed of the proper material for the liquid being handled. The design of our apparatus conforms with the most modern and accepted engineering practise.

The copper jacketed still, shown on this page, is tested to 100 pounds steam pressure and can be built in sizes up to 300 gallons capacity.



COPPER STEAM JACKETED STILL

SERVICE

We will be pleased to estimate on any plans or specifications that may be sent us by chemical engineers or others in charge of the design, or the operation, of plants employing chemical processes and using copper apparatus.

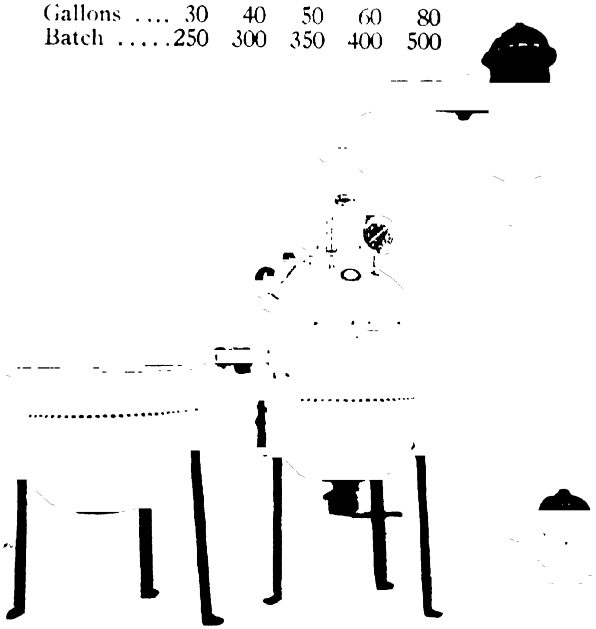
Our experience makes us confident that we can render satisfactory service in building any type of copper apparatus.

We will guarantee to carry out designs in a faithful and intelligent manner, but when requested we will be pleased to assist with our practical knowledge of coppersmithing to supplement our clients' ability as engineers.

LATEST IMPROVED VACUUM PAN

Complete with Steam Jacketed Boiling Kettle, Condenser and Vacuum Pump. Our Pan and Boiling Kettle are made out of heavy copper and tested to 200 lbs. water pressure. This pan is mostly used for cooking Hard Candy, Cream, Syrup, etc.

Gallons	30	40	50	60	80
Batch	250	300	350	400	500



LATEST IMPROVED VACUUM PAN

Trade-Mark

EDWARD H. BEST & CO., INC.

"Knoxall Textiles"

222-224 Purchase Street

BOSTON, MASS.

PRODUCTS

- Clearer Cloth
- Roller Cloth
- Slasher Cloth
- Finishing Fabrics
- Fume Bags, Cotton and Wool
- Polishing Felts
- Filter Cloths, Pure Wool
- Filter Cloths, Cotton, Camel's Hair, Linen and Silk
- Cotton Sheetings and Ducks
- Mechanical Felts, Cotton and Wool
- Endless Woolen Blankets and Jackets

SPECIALISTS ON MECHANICAL FABRICS

The efficient application of mechanical fabrics plays an important part, when used in manufacturing processes. We all realize that we can spend unnecessary sums of money in using fabrics not at all suited for our work. Considering this, it has been our aim to solve the various problems that confront manufacturers, with the purpose of producing special constructions, that meet, to the best advantage, the specific needs.

If you have any problems that require fabrics, no matter what construction, whether Cotton or Wool, please allow us to cooperate with you. We offer the advantage of our thirty-five years' experience.

In the manufacture of our Woolen goods, great care is used in the selection of proper yarns. These constructions are made of pure, live Wool, free from all adulteration; we do not use shoddy, or fillers of any kind. We are positive that the satisfactory results, and greater length of service obtained with the use of such fabrics will prove to your advantage.

ROLLER, CLEARER AND SLASHER CLOTHS

Our Roller, Clearer and Slasher Cloths are considered the standard among Cotton and Woolen manufacturers. They are made of pure, live wool, free from adulteration.

FINISHING FABRICS

We carry an extensive line of Leaders and Aprons, both Cotton and Wool, for various Finishing processes.

WOOLEN BLANKETS

We can furnish Blankets or Jackets of various thicknesses, and practically any size, length or width. These are made seamless.

FUME BAGS

Our Woolen Bags are made of specially selected yarn, in a construction best suited for the purpose. We can furnish any size; also carry Cotton Bags, of various sizes, made up to standard specifications.

FILTER CLOTHS

We aim to carry a complete line of constructions, both Cotton and Wool, in various sizes, as well as Camel's Hair. For many years we have been helping solve the unusual problem. This is our special interest, and, if you have any such problem, should like to offer you our cooperation. Our Knoxall Wool Filter fabrics are made of pure live Wool.

STANDARD OPERATIONS

For standard operations we maintain a stock of materials that will assure prompt delivery.

SPECIAL CONSTRUCTIONS

If you require a special construction of fabric, either Cotton or Wool, let us help you.

BETHLEHEM FOUNDRY & MACHINE CORPORATION

Engineers and Contractors

Singer Building, 149 Broadway
NEW YORK, N. Y.

131 Front Street
BETHLEHEM, PA.

PRODUCTS

Chemical Equipment of Metal, including:

Autoclaves	**Stills**
Cooling Tubes	**Nitric and other Retorts**
Condensers	**Sight Glasses**
Kettles	**Plain and Separating**
Mixers	**Sulphonators**
Nitrators	**Vacuum Stills**
Reducers	**Washers**
Reducer Blades	**Heaters and Coolers**

Special Equipment of all kinds.

We are prepared to furnish Lead Lined Equipment.

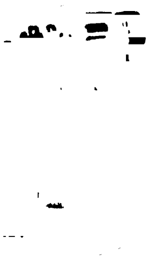
GUARANTEE

We cannot guarantee users of our equipment against personal or plant injuries or loss of material when operating, but we do guarantee no chaplets, filling or "doctoring" of parts in contact with chemicals; all material and workmanship to be of highest grade applicable to this class of equipment.

Capacities are calculated to main cover flanges.

Cut gears are invariably used unless others stated.

NITRATORS



NITRATOR

With either corrugated or plain cylindrical walls. Fitted with one propeller of true marine type and draft tube (non-swirl). (Patented.) Propeller locked to end of shaft to prevent coming off. Vertical thrust supported by ball bearing with dust proof cap.

Cast iron body in steel jacket so designed that a forced circulation through the internal tubes and jacket may be obtained. Everything complete.

TABLE OF DIMENSIONS

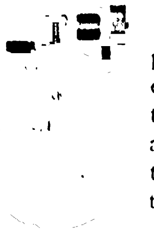
Capacity in gallons to main cover flange	50	100	300	600	800	(Corrugated) 1000	(Corrugated) 1600
Inside diameter of vessel	21"	2'6"	3'6"	4'3"	4'8"	4'7½" (Average)	5'11" (Average)
Inside depth of vessel	1'11½"	3'0"	5'0"	6'0"	7'0"	8'6"	8'0"
Height over all	5'1½	5'1¾"	8'1½"	9'5½"	10'6½"	11'8"	13'8"
Floor space	3'4"x2'8"	3'8½"x3'3"	4'11"x5'3½"	6'2½"x5'7"	6'7"x6'1"	7'0"x6'6½"	7'10½"x7'10½"
Pulleys, tight and loose	12"x2½"	12"x2¾"	15"x3½"	20"x4½"	20"x4½"	20"x4½"	20"x4"

Usual Propeller Speed . . . . 250 R P M

Usual Pulley Speed . . . . . 300 R P M

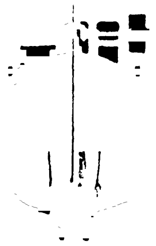
Nitrators of 100 gallons capacity or larger either with or without internal cooling tubes, as may be desired

SULPHONATORS



SULPHONATOR

Sulphonators of plate steel or cast iron equipped with draft-tube (non-swirl), or any other type of agitator to suit conditions.



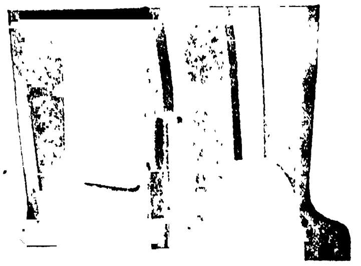
SULPHONATOR

TABLE OF DIMENSIONS

Capacity to main cover flange in gallons	50	100	300	600	800	1800	2300
Inside dia of vessel	24"	2'5"	3'3"	4'0"	4'6"	6'0"	6'0"
Depth (inside)	30½"	3'6½"	5'7"	7'0"	7'6"	9'0"	11'0"
Height over all	4'5"	6'8½"	10'9½"	11'5"	12'7"	14'0"	15'1"
Floor space	3'3"x3'9"	3'6"x3'10½"	4'9"x4'4"	5'4"x5'4"	6'1"x6'1"	7'6½"x7'8½"	7'6½"x7'8"
Pulleys	12"x2½"	12"x2½"	15"x3"	16"x4½"	16"x4½"	24"x4½"	24"x4½"

Usual propeller speed, 250 R P.M. Usual pulley speed, 300 R.P M.

DRAFT TUBES (Patented)



DRAFT TUBE (Patented)

Inverted where precipitates are present

SIZES

Non swirl Draft Tubes are made for the following diameters of right hand propellers, running clockwise

12 in.
15 in
18 in
21 in
24 in.
30 in.
36 in.

Larger sizes can be supplied to order.

For use in vessels in which it is desired to mix thoroughly liquids of different specific gravities. The vanes counteract the swirling motion caused by the propeller, that occurs where using many other or no tubes. By the non-swirl method the center or core of liquid is continually brought to the wall of the main container and a more thorough mixing and heat exchanging condition is obtained. Settling tanks equipped with the non-swirl tube are superior to others —there being no swirl, the material may begin settling immediately.

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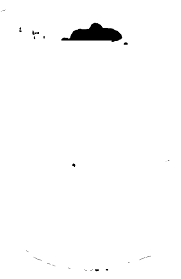
REDUCERS, PLAIN OR JACKETED


STEAM JACKETED REDUCER

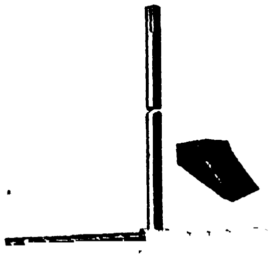
Cast iron shell and cover. Cast iron lining plates easily replaced. Solid vertical cast iron or steel shaft, as desired, suspended from bearing in heavy yoke at top of reducer. Removable without disturbing pulley shaft. Either single blade or plow scrapers, as desired. Specially designed bottom step bearing. Steam admitted through door.

Also made with simple lifting device for main shaft

TABLE OF DIMENSIONS

Capacity to main cover flange in gallons	200	500	1600
Diameter (inside)	3' 0"	4' 0"	6' 2"
Depth (inside)	4' 3"	5' 3"	8' 0"
Height over all	6' 7"	7' 6¼"	10' 4½"
Floor space	4' 6¼" x 3' 6"	6' 10" x 4' 8"	8' 7" x 6' 9"
Pulleys	20" x 4¼"	24" x 4¼"	30" x 9"
Gear ratio	2 : 1	3 : 1	50 : 18
Pulley speed	80	120	110

REDUCER BLADES (Patented)


REDUCER BLADE (Patented)

Experience has shown that the ordinary form of reducer blade is inefficient and unsatisfactory, because of the difficulty of making repairs and the necessity of discarding an entire agitator should one blade become worn.

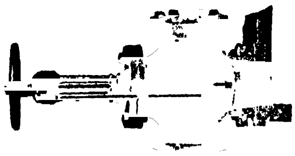
We have designed and patented a special form of blade, permitting any plow to be removed through the hand hole when worn out, avoiding the necessity of anyone entering the machine and thus eliminating the risk of aniline poisoning. Similarly a whole arm may be replaced without difficulty.

We not only supply these blades with our own reducers, unless otherwise requested, but also are ready to remodel reducers of other makes introducing this improvement.

Some of the largest users of reducers have adopted the new form of blade throughout their entire installation.

Insert shows one section of removable blade.

REDUCER VALVES

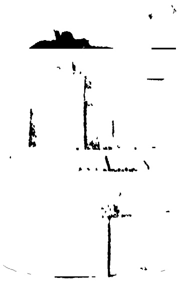

REDUCER VALVES

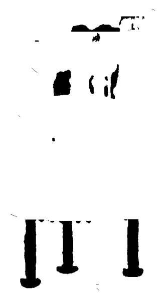
This valve was designed to obviate the necessity of cleaning the valve seat after every charge.

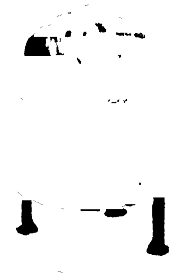
Up to date of printing they have been in actual use for over a hundred charges, without changing, repairs or leakage. The stem has a short thread for quick opening.

VACUUM STILLS

75 GALLON CAST IRON STILL


6' OIL JACKETED VACUUM STILL


5' STEAM JACKETED STILL


8' STEAM JACKETED STILL

Body cast iron and jacket of cast iron or steel. Heavy vertical shaft suspended at top by double thrust ball bearing and guided at bottom by step bearing, is driven by very heavily constructed back geared worm and wheel.

Substantial bottom and side scrapers mounted on vertical shaft.

Stills are designed throughout for heavy duty and are extensively used for acetic acid and aniline distillation and similar operations.

Seventy-five Gallon Cast-Iron Still—For semi-commercial use in developing new processes and other cases where **small** equipment of **actual commercial type** is required.

TABLE OF DIMENSIONS, ETC., OF OIL AND STEAM JACKETED VACUUM STILLS

Capacity in gals to main flange	75	500	800	1400–1600
Inside diam of vessel	25"	60"	72"	96"
Inside depth of vessel	24"	42"	48"	48"
Height over all excluding columns or setting	62"	93¼"	118"	112¼"–122¼"
Floor space	38" x 42"	77" x 85"	94" x 94"	115" x 115"
Pulleys — tight and loose	24" x 4"	24" x 6"	24" x 8"	(one) 22" x 10½"
Pulley speed (usual) R. P. M	120–160	190	160	160

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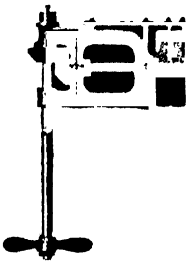
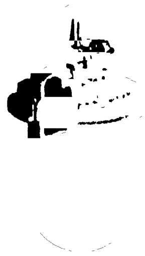
STANDARD DRIVE


STANDARD DRIVE

A high-grade, self-contained drive for any piece of chemical apparatus. Cast iron frame. Fully enclosed ball thrust bearing at upper end of vertical shaft. Vertical shaft bearings bronze bushed. Horizontal shaft bearings babbitted. Gear ratio 4 to 5 (may be altered slightly). Cut gears. Propellers of true marine type locked to shaft by cross-key to prevent coming off. Tight and loose pulleys. No oil cups furnished. Belt shifter and gear guards.

Note.—Lower bearing may be left off in case customer desires to place this in cover of apparatus.

AUTOCLAVES


AUTOCLAVE

In the design and building of our autoclaves we have realized fully the high pressures required for operating safety and efficiency.

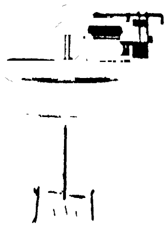
We build these machines with an ample factor of safety in order to meet the most exacting requirements. They are built with or without steel-jackets, and are cast from plain or semi-steel or from a special steel to formula. We also will build these machines to specification.

EMULSIFIER

We have developed an emulsifier which has proved itself over a period of several months of continuous operation under severe actual service conditions.

Temporary emulsions are quickly and completely emulsified, the machine giving general operating satisfaction to users.

This machine has been applied by some manufacturers to the mixing of materials that are of such a nature as to require an unusually sturdy mixer, together with an efficient type of agitator. It is steam-jacketed. Capacity, 100, 200 and 400 gallons. Other sizes can be built on order.


EMULSIFIER

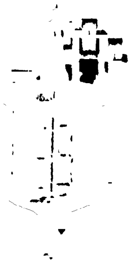
BETHLEHEM DOUBLE ACTION VESSEL

This apparatus is efficient for the mixing of a light liquid with a heavier previous charge.

It contains a slow speed horse-shoe scraper-type agitator running close to the wall of the vessel, and a high speed propeller agitator rotating in the opposite direction. They may be driven simultaneously or singly, as desired.

The action of the propellers causes the lighter liquid to gather near the center, from which it is combed into the mass by the parallel rods.

This vessel is designed for a capacity of 200 gallons.


DOUBLE ACTION VESSEL

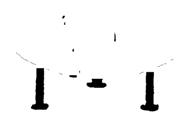
WASHERS

Specially designed washers, constructed of steel plate—lead lined if desired—agitators to suit, with or without Non-Swirl Draft Tube. May be equipped with steam coils if desired.

WASHER

JACKETED STILLS

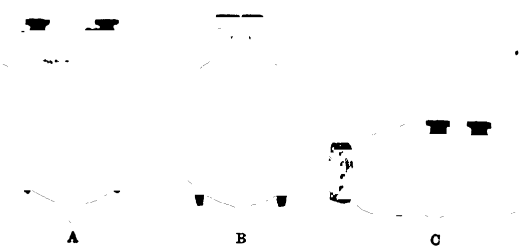
Specially designed stills, either jacketed or plain and arranged for various forms of heating, including steam coils, are furnished by us. Size and number of outlets to suit customers' requirements.


JACKETED STILL

CONDENSERS

The tanks of these condensers are of steel plate (or any other metal to suit) and the coils of iron pipe, seamless steel tube, copper, aluminum, silver, lead, etc.

These condensers can be built in any size required.


A B C
THREE TYPES OF ACID EGGS

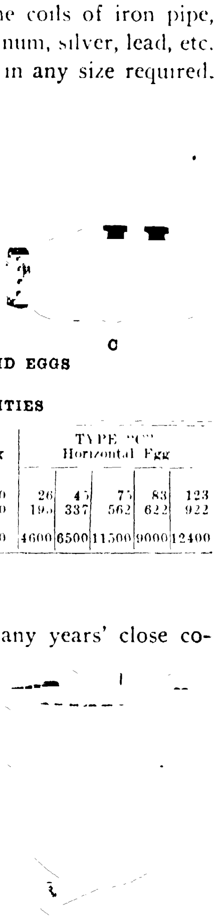
SIZES AND CAPACITIES

	TYPE "A" Vertical Egg				TYPE "B" Vertical Egg		TYPE "C" Horizontal Egg				
Capacity Cu ft	17	24	54	66	35	80	26	45	75	83	123
Gals	127	180	405	495	262	600	195	337	562	622	922
Approx wt (lbs)	3900	4700	7400	8600	6000	10750	4600	6500	11500	9000	12400

NITRIC ACID RETORTS

These retorts are based on many years' close cooperation with the user. The mixture has been carefully developed and the resultant life is prolonged thereby.

Each retort is a duplicate of a previous one, as we use one formula for them and each heat is sampled and analyzed. Each retort is successful and you will find a duplicate of it in our foundry.


NITRIC ACID RETORT

BETHLEHEM FOUNDRY AND MACHINE CO.

131 FRONT ST., BETHLEHEM, PA.

NEW YORK OFFICE SINGER BUILDING, 149 Broadway

PRODUCTS

"Bethlehem Built" Apparatus:

- **Acid Eggs**
- **Acid Tanks**
- **Autoclaves**
- **Acid Stills**
- **Chemical Pots**
- **Chemical Castings**
- **D. Retorts**
- **Salt Pans**
- **Special Valves**
- **Special Fittings**
- **Nitrators**
- **Sulfonators**
- **Reducers**

Iron and Steel Apparatus for the manufacture of Sulphuric, Nitric, Muriatic, Stearic and Other Acids.

A wide variety of General Apparatus.

TECHNICAL CONTROL IN OUR PLANT

We actually have, in every detail, Chemical Control in our foundry. This control extends from sampling and analyzing our raw materials, that include pig-iron, coke, machinery scrap, etc., to the testing and analyzing of our castings.

Our metallurgical chemists control every heat in the foundry and supervise the charging of the cupola.

This thorough control by our experts accounts for the high quality and reputation of our products.

DEPRECIATION

The depreciation that goes on in all industrial equipment reaches a point at some time where renewal is necessary for efficient operation of a process. Many industrial plant operators having found a piece of chemical equipment very successful in operation often hesitate to place an order for a duplicate unit, as they fear the new one will not be as satisfactory as the first. They make many repairs far beyond the recognized period of efficient operation and maintenance of equipment.

Wherever done this results in poor plant economy in the long run.

Because of our absolute foundry control of each piece of equipment and every casting turned out by us, our customers know we can always duplicate our efficient equipment.

We have helped many of the largest concerns in the country to solve their most difficult problems. This experience is at your service.

"CORROSIRON"

For equipment requiring an acid resisting iron we use "Corrosiron."

This highly successful product is supplied by us in the East under a special arrangement with the Pacific Foundry Company, San Francisco, Calif., the originators and proprietors of "Corrosiron."

This co-operative arrangement includes the production and sale of "Corrosiron" castings from our South Bethlehem plant.

Corrosiron needs little introduction to men interested in a machinable chemical resistant metal. It is a very superior acid and alkali resisting metal.

Especially in connection with sulphuric and nitric acid process has CORROSIRON proven its acid resistance.

Supplied in the shape of pumps of various kinds, plug cocks, globe valves, pipes and castings of every variety. We will gladly send you a sample to undergo any test you may wish to make.

ADVANTAGES OF CORROSIRON

Wherever "Corrosiron" has been employed in the making of chemical apparatus, it has been found to meet the demand for an anti-corrosive iron.

It has endurance beyond that possessed by other mixtures.

It is dependable at all times, where the unusual is required of the metal.

"Corrosiron" used in making of chemical castings by the Bethlehem Foundry and Machine Co. is a guarantee above that commonly offered to purchasers.

BETHLEHEM POLICY

Our policy is to make our foundry and our shops, our engineers and specialists a part of our customers' organization in so far as solving their troubles and developing their ideas are concerned. This policy we feel is necessary to the attainment of successful operations in the chemical industries of the United States; so much a part of the further development of chemical products in peace time competition with those of other nations.

CUSTOMERS' DESIGNS PROTECTED

Our product is built entirely from customers' specifications, under careful supervision, including chemical control of all mixtures.

Every customer is scrupulously protected as to his exclusive ideas or designs.

THE BIEHL IRON WORKS

Incorporated

Designers and Builders of Industrial Cars

READING, PA., U. S. A.

PRODUCTS

Industrial Cars, Rails, Portable Track, Switches, Crossings, Turntables, Wheels and Axles, Car Unloaders, Charging Barrows, Coal and Ore Tubs.

BIEHL EQUIPMENT

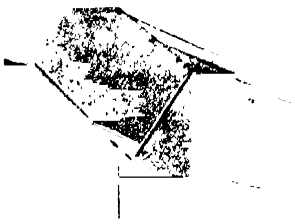
Our products are the best of their kind to be had. Use our equipment and be convinced.

Biehl cars are built to suit any industrial requirement.

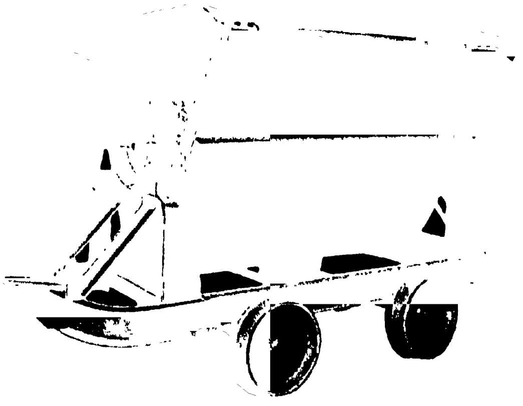
Buckets are built in all standard sizes and capacities.

Full specifications and blueprints of our equipment for any purpose upon request.

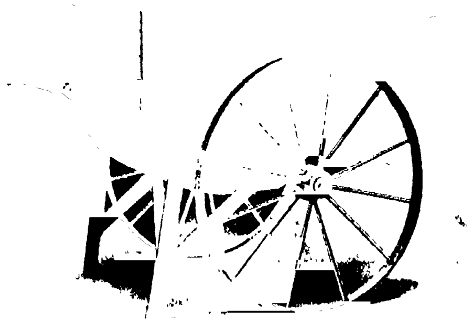
Our experience of over sixty years gives customers entire benefit in proper design and construction.



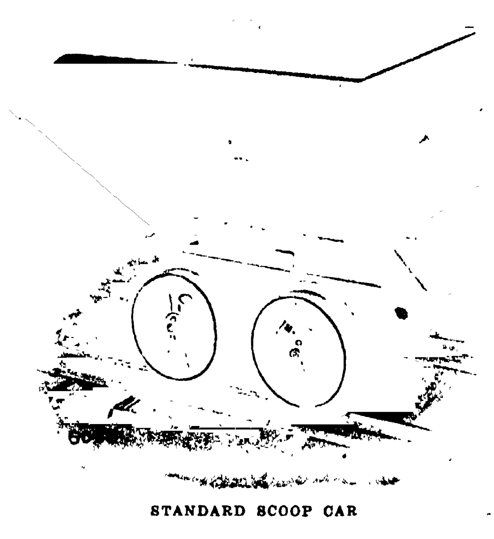
STANDARD CAR UNLOADER



STANDARD SIDE DUMP CAR



BIEHL FIGURE 38 CHARGING BARROW



STANDARD SCOOP CAR

COAL AND ORE TUB

THE BIGGS BOILER WORKS COMPANY

Manufacturers of

Steel Storage and Pressure Tanks of Every Description

Paper Mill Machinery, Rubber Machinery

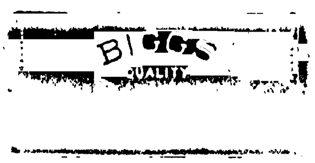
WILLIAMS AND BANK STREETS, AKRON, OHIO

PRODUCTS

Steel Tanks of every description including Mixing Tanks, Steam Jacketed Tanks, Pneumatic Water Supply Tanks, Air Receivers, Hot Water Storage Tanks, Oil and Gasoline Storage Tanks, Condensers, Coolers, Evaporators, Steel Riveted Pipe, Smoke Stacks, Steel Plate Construction of every description, Vulcanizers, Devulcanizers, Globe and Cylinder Rotary Bleaching Boilers.

STORAGE AND PRESSURE TANKS

We are prepared to ship from stock Steel Storage and Pressure Tanks ranging in capacity from 84 to 25,000 gallons Our line of Standard Pressure Tanks that we carry in stock are designed for working pressures from 75 to 110 lbs. and include such tanks as Pneumatic Water Supply Tanks, Hot Water Storage Tanks and Air Receivers If interested in tanks of this description, write for Price List "F."

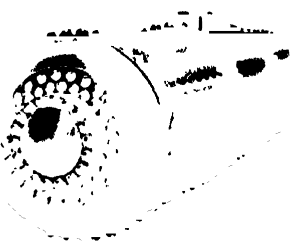


STORAGE AND PRESSURE TANK

Our line of Storage Tanks consists of what is commonly termed Extra Heavy Gasoline and Oil Storage Tanks, and are covered by our Price Lists No 25 and No 30. These Lists are very complete, giving the weight, capacity, thickness of material, etc., on 166 tanks Capacities range from 85 to 25,000 gallons Our Gasoline Storage Tanks, when desired, are furnished with Underwriters' Label, the construction meeting the Underwriters' requirements.

HIGH PRESSURE TANKS

The accompanying illustration shows an extremely high duty tank for working pressures of 500 to 600 lbs. The shell plates of the tanks are 1¼″ in thickness, rivets 1 5/16″ diameter. Inasmuch as our plant is hydraulically equipped thruout, we are in position to fabricate plates up to 1½″ in thickness, and specialize in steel plate construction of every description, such as Riveted Steel Pipe, Penn Stocks, etc.



HIGH PRESSURE TANK

ROTARY BLEACHING BOILERS

Our Globe and Cylinder Rotary Bleaching Boilers are recognized as standard equipment by the majority of the leading paper mills in the United States and Canada

The Cylinder Rotary Bleaching Boilers are furnished in various sizes, and are used principally in the cooking of rags, rope, paper, etc.

ROTARY BLEACHING BOILER

The Globe Rotary Bleaching Boilers are used extensively by the strawboard mills for the cooking of straw, grass and various similar materials for the making of strawboard. The 14′ diameter is the size most commonly specified, although we are prepared to furnish our Globes in practically all sizes The accompanying illustration shows a small 3′ diameter Globe with welded joints for experimental purposes.

VULCANIZERS FOR RUBBER WORKS

Our last specialty—and by no means the least important—is Vulcanizers for the rubber trade. We have furnished the rubber trade with vulcanizers since 1887, and Biggs Vulcanizers have been adopted as standard equipment by practically all leading rubber companies Our Simplex Patented Quick Opening Door which opens and closes without the use of mechanical means of any description, the operation being completed in less than eight seconds, is recognized by engineering experts and leading insurance companies as the safest and most efficient door on the market. This door can be furnished in all sizes and for all pressures, and is used not alone on vulcanizers, but on Retorts of any description where it is desirable to have the entire end open for loading and unloading, such as Creosoting Cylinders, Hardening Cylinders, Sterilizers, etc.

RUBBER VULCANIZER

PRICE LISTS

Price Lists and Catalogs on our complete lines will be gladly furnished on request.

J. BISHOP & CO. PLATINUM WORKS

Manufacturers and Refiners of Platinum, Gold and Silver

THE FIRST PLATINUM WORKS IN THE UNITED STATES

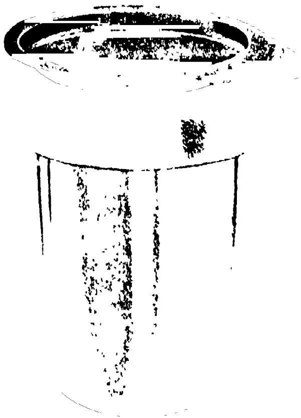
1842—Seventy-Nine Years' Experience in Platinum Working—1921

MALVERN, PA.

PRODUCTS

Platinum ware in any form for Chemical, Electro-chemical and Metallurgical uses, including:

- **Crucibles, plain and special form**
- **Dishes**
- **Retorts**
- **Cones**
- **Pans**
- **Bottles**
- **Filters**
- **Combustion tubes and boats**
- **Tongs**
- **Muffles**
- **Anodes, solid or spiral**
- **Tweezers**
- **Spatulas**
- **Cathodes, solid or mesh**
- **Electrodes in all forms and sizes**
- **Triangles**
- **Cautery points**
- **Wire**
- **Foil**
- **Spoons**
- **Gauze**
- **Sheet**
- **Rivets and Contacts**
- **Platinum sponge**
- **Surgical, Physical and Chemical Apparatus**
- **Other metals of the Platinum group, pure or alloyed**
- **Assaying of metals of the Platinum group**
- **Platinum Scrap bought or taken in exchange**
- **Palladium**
- **Iridium**
- **Platinum-Rhodium Thermo Couples**
- **Salts and Solution of the Platinum Metals**



HAMMERED PLATINUM CRUCIBLE
Fig. 25

TRADE
MARK

GENERAL

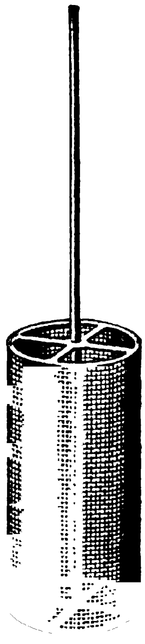
Bishop standard platinum laboratory ware is made from platinum that is specially refined for the purpose. Before shipping it is subjected to a rigid test and is guaranteed against chemical or physical defects. Special forms for special purposes for the analyst, metallurgist, and manufacturing processes.

HAMMERED PLATINUM DISH
Fig. 20

Crucibles weigh as many grams as their cc. capacity.

Dishes weigh approximately one-third as many grams as their cc. capacity.

CATALOG ON REQUEST



PLATINUM
CATHODE
Fig. 69

BLEACH PROCESS COMPANY

Designers of Complete Electrolytic Plants

APPLETON, WISCONSIN

FOREIGN REPRESENTATIVES

Montreal, Que., Process Engineers, Ltd., McGill Building   London, Eng., Ernest Scott & Co., Kingsway

PRODUCTS

The Wheeler Process with The Wheeler Circular Cell for the manufacture of Chlorine Gas, Liquid Chlorine, Bleach, Caustic Soda and Caustic Potash.

OUR SERVICES

Engineers—We furnish blueprints, directions, specifications and instructions to enable an engineer to erect, install and operate a complete plant or any part thereof.

Operators—We will supply competent men, familiar with all phases of the process, to start or operate a new installation, or any part thereof.

Instructors—We will teach men sent by the purchaser, in a running plant, that they may become familiar with all details of construction or operation.

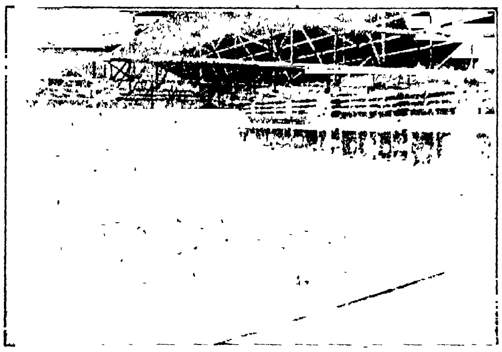
Purchasers—We will purchase any part of a plant for a client, or work in conjunction with another purchasing agent as may be preferred.

Consultants—We will act as consulting engineers in connection with an installation to the end that the purchaser will obtain the results predicted.

THE WHEELER PROCESS

Practical experience has demonstrated the fact that the auxiliary equipment and the operation of the plant are as important as the cell. The use of evaporated or marine salt, the concentration of the cell effluent, the recovery of the salt, the finishing of the caustic soda or potash, the manufacture of dry bleach or the adaptation of the plant to other processes, each presents special problems.

Nineteen years of experimenting and practical experience in the development of The Wheeler Process permits us to predict with certainty what can be accomplished under all conditions in any locality.



WHEELER CIRCULAR CELLS

An installation in a cell room 52 ft. by 90 ft. including aisles. Producing 3650 tons of caustic soda annually

THE WHEELER CIRCULAR CELL

Advantages:

Low cost of installation
Ease of operation
Saving of floor space
Low maintenance cost
Accessibility
Maximum efficiency

Our cell form permits a design which delivers the highest efficiencies with long diaphragm life and minimum stub loss.

There are more circular cells in operation than all other types combined.

DATA

Our plant records show the following:

Cells of the same form operating at either 500 amperes or 1200 amperes with equal efficiency.

Cells occupy less than 11 sq. ft. of floor space including aisles per 1000 cell amperes.

Cell series delivering 99% of the theoretical amount of caustic soda.

Untreated anodes in continuous service for more than 400 days.

Paper diaphragms after 100 days' service still operating at over 94% current efficiency.

Paper diaphragms costing less than two dollars, delivering over five tons of caustic soda.

Chlorine better than 94% purity and containing less than 0.02% hydrogen.

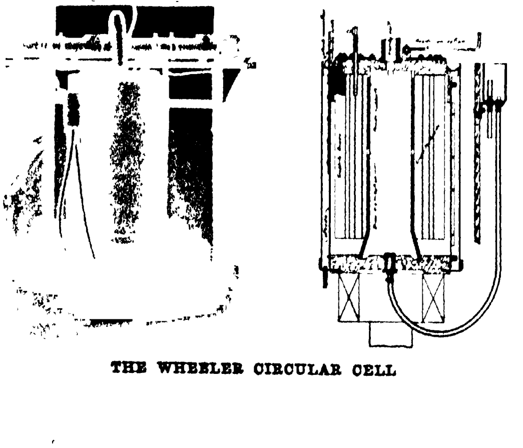
Highest efficiency obtained without the use of steam in the cells.

Cell Room is free of chlorine gas, alkali dust or other annoyances.

Evaporator tubes in continuous service for more than three years.

Dry bleach chambers delivering 37% available chlorine in the bleaching powder the year around.

Caustic finishing furnaces requiring less than 1000 pounds of coal per ton of finished caustic.



THE WHEELER CIRCULAR CELL

BLAW-KNOX COMPANY

Manufacturers of Steel Products

MAIN OFFICE AND WORKS: BLAWNOX (PITTSBURG), PA.

BRANCH OFFICES

New York, 165 Broadway
Chicago, Peoples Gas Building
San Francisco, Monadnock Building
Boston, Little Building
Detroit, Lincoln Building
Baltimore, Bayard and Warner Streets
Kansas City, Interstate Building
Birmingham, Ala., American Trust Bldg

PRODUCTS

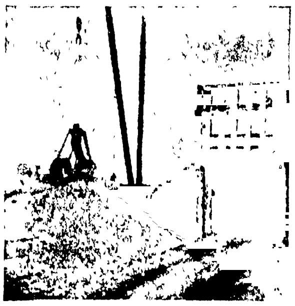
Prudential Steel Buildings (Sectional)
Buckets (Clamshell)
Steel (Fabricated)
Plate Work
Furnace Appliances (Patented)
Transmission Towers
Forms (Steel)
McKune System of Open Hearth Furnace Construction
Sheldon Mechanical Gas Producers

SERVICE

Blaw-Knox Service is a part of every Blaw-Knox product. The engineering skill and experience brought to bear upon individual problems insure the adaptation of every Blaw-Knox product to meet the specific need of the customer.

BLAW CLAMSHELL BUCKETS

The Single Line—Blaw Single Line Buckets will operate on any single drum hoist or crane. They can be hooked on or off the crane or hoist at a moment's notice, thus releasing the hoist for other duty, without the delay necessitated by reeving or they can be reeved direct to the hoist. Single Line Buckets are suitable for rehandling loose bulk materials and will stand up under unusually severe service.



BLAW SINGLE LINE CLAMSHELL BUCKET

GENERAL DIMENSIONS OF BLAW-KNOX "HOOK ON" TYPE OF SINGLE LINE BUCKET. ALL BUCKETS EQUIPPED WITH GUIDE SHEAVES EXCEPT "OPEN HEAD" TYPE.

Size No.	Rated size cu yds	Wgt lbs	Height open	Scoop Spread		Width	Operating Head Room* when reeved internally		Description
				Open	Closed		2 p't's	3p't's	
305	½	2000	6'-4½"	5'-0"	4'-1½"	2'-11½"	12'-8½"	15'-7"	Standard
310	¾	2700	7'-6"	6'-6"	4'-8"	3'-2"	14'-5"	18'-2"	Standard
310W	1	3200	7'-6"	6'-6"	4'-8"	4'-2½"	14'-5"	18'-2"	Extra wide
311	¾	2675	6'-10"	6'-6"	4'-8"	3'-2"	9'-0"	12'-9"	Open head
311W	1	3350	6'-10"	6'-6"	4'-8"	4'-2½"	9'-0"	12'-9"	Open head extra wide
315	1	3700	8'-10"	7'-5"	5'-7"	3'-3"	16'-3"	20'-6"	Standard
316	1	4050	8'-10"	7'-5"	5'-7"	3'-3"	16'-3"	20'-6"	Extra heavy scoops
325	1½	4250	9'-2"	9'-2"	6'-10"	3'-3"	16'-7"	20'-4"	Narrow type
320	1½	5250	9'-2¾"	8'-0"	5'-10½"	4'-0"	19'-4"	24'-3"	Standard
321	1½	6100	9'-2¾"	8'-0"	5'-10½"	4'-0"	19'-4"	24'-3"	Extra heavy scoops
323	1½	5600	8'-4¾"	8'-0"	5'-10½"	4'-0"	11'-7"	16'-6"	Open head type
327	1¾	5900	9'-2¾"	8'-0"	5'-10½"	4'-7½"	19'-4"	24'-3"	Standard
328	1¾	6400	8'-4¾"	8'-0"	5'-10½"	4'-7½"	11'-7"	16'-6"	Open head type
330	2	10500	10'-10"	9'-0"	7'-1"	4'-8"	21'-3"	26'-0"	High power extra heavy scoops
333	2	9200	10'-10"	9'-0"	7'-1"	4'-8"			High power Standard scoops

* This is the distance which bottom of bucket measures below hook after dumping. There is somewhat less clearance needed for loaded bucket.

BLAW SPEEDSTER BUCKET

The Speedster—The Blaw Speedster Bucket is the fastest rehanding bucket made. It is especially designed for economically rehandling loose bulk material such as sand, coal, gravel cinders, granulated slag, etc., as it enables the operator to obtain the greatest yardage from a derrick or crane.

BLAW DREADNAUGHT BUCKET

The Dreadnaught—The Blaw Dreadnaught is the most highly developed digging clamshell on the market. It is a straightforward development of the widely favored lever arm type of bucket, combining great closing power with very few moving parts. The Dreadnaught line consists of stock sizes from ¾ yd. ratings up to 5 yds. and larger and covers all requirements for operating on derricks, cranes, monorails, dredges and special hoists. It will dig earth, bank sand and gravel, plastic and tough clay in the dry or under water. It is very efficient in handling a variety of dry granular materials, acid phosphate, heavy ores, etc.

The Blaw-Knox line of Clamshell Buckets, in addition to the types mentioned above, includes the Blaw Bulldog—designed especially for heavy quarry and steel mill service; the Blaw Power Wheel a general service bucket of unique design; the Blaw Collier for rehandling light, loose bulk materials; the Foundry Type a single line bucket requiring minimum head room; the Bridge Type built for use on cableways and inclined trolleys; the Blaw Fourline designed for use on crane and bridge trolleys; Blaw Automatic Single Rope Cableways and Blaw Holding Drums.

THE BLAW BUCKET MANUAL

A handbook for engineers is now ready for distribution. This book contains 72 pages of detailed information about clamshell buckets and is illustrated with photo-engravings and line drawings. A copy will be sent free upon request.

FORGE AND HAMMER WELDING

What is Hammer Welding?

Forge and hammer welding is the uniting of two pieces of weldable iron or steel by means of heating

Continued on Next Page

and hammering. Whenever one or the other is omitted, a true weld is not obtained. The following conditions present a short synopsis of the hammer welding process:

First—The Steel is heated with a water gas flame and the burners are applied from two sides. This insures all parts of the steel becoming molten at practically the same time.

HAMMER WELDED OIL CRACKING STILL

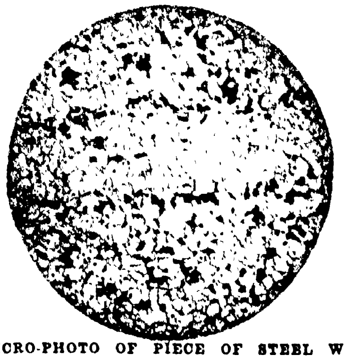
Second—The burners are large and do not restrict the heating to a narrow zone of metal. The plate attains a temperature of above 1500°F. for a considerable distance on each side of the weld.

Third—When the welding temperature is obtained, the burners are rapidly withdrawn and replaced with pneumatic hammer and anvil. The force of the blow is regulated from light to heavy. The hammer blow is very light and quick at the beginning and increases in weight as the metal gradually becomes colder. This hammering accomplishes two things: first, it draws the metal out from double thickness (due to lapping) to the original thickness of the plate. In so doing, the metal is joined together and the length of the weld is ordinarily from four to six times the thickness of the plate. Second, due to the high temperature of the steel for welding, the structure is changed and the hammering restores the fibrous structure of the steel. The hammer blows break up the large grains and the final plate involved in the weld (because it is worked more) assumes a compact structure which may be even better physically than the remainder of the shell. After the welding has been completed, every piece is subjected to thermal after treatment (annealing). This insures the removal of any stresses which have been set up in the metal due to welding. This requires very large and special annealing furnaces.

Water Gas

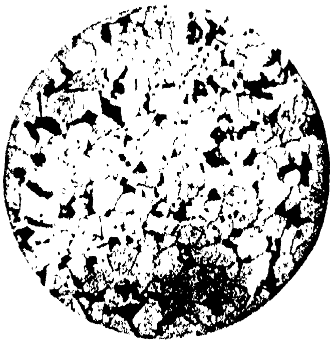
Water gas is used for heating. First, because only 2 cu. ft. of air is required to burn each cubic foot of gas. It is, therefore, very easy to obtain a non-oxidizing or reducing flame. Second, the flame temperature is about 3400°F. This is high enough above the melting point of steel to enable a welding temperature to be obtained quickly, but at the same time it is low enough to minimize the danger of burning the steel. Third, the gas is made in our own producer plant and is free from any impurities.

The water gas flame completely surrounds the metal being welded and thereby prevents any possibility of oxidation while the weld is being made.



96135-D—MICRO-PHOTO OF PIECE OF STEEL WELDED BY BLAW-KNOX FORGE AND HAMMER WELDING PROCESS

Enlarged 100 diameters Note the perfect joining of the metal, also that the large grains have been broken up and a more compact structure is obtained due to the hammering



96136-A—MICRO-PHOTO OF NORMAL STEEL ENLARGED 100 DIAMETERS

Note large crystalline structure

The Personal Element

The personal element does not enter into hammer welding, as will be noted in the following discussion. The water gas flame prevents any impurities or scaling of the welding surfaces; the flame temperature is low so that there is not the danger of burning the steel; the anvil and hammer being mechanically operated, the perfectness of the weld is not dependent on the physical strength of the operator. Owing to these conditions, uniform welding is obtained and we are able to guarantee an efficiency at the weld of 90 to 95 per cent. of the original strength of the plate.

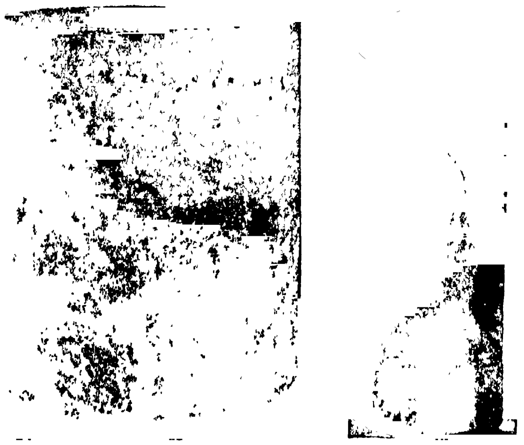
Reason for Hammer Welding

In many branches of manufacture to-day, circular or rectangular boxes, tanks or pressure vessels are required to withstand wide variations in pressure and temperature, or a combination of both, and at the same time to remain absolutely leakless. Steel or iron castings are unsatisfactory as there is a constant danger of cracking and also leakage due to blow holes, sand holes and other inequalities in the structure of the metal. Riveted steel plate can be made practically tight at the beginning, but the constant expansion and contraction soon loosens the grip of the rivets and is a constant source of trouble. With forge and hammer welded equipment there are no joints as the welds are so perfect that the structure can be considered one piece of steel.

Limitations—The sizes of forge and hammer welded equipment are limited only by transportation facilities and the sizes of plate rolled by the steel mills. The largest diameter of tank which can be handled by the Railroad is about 10 ft. 6 in. Tanks as long as

Continued on Next Page

140 ft. may be shipped. Our bending rolls are of special design and all circular work is rerolled after welding. At the present time we are able to weld any plate between ⅜″ and 1½″ thick



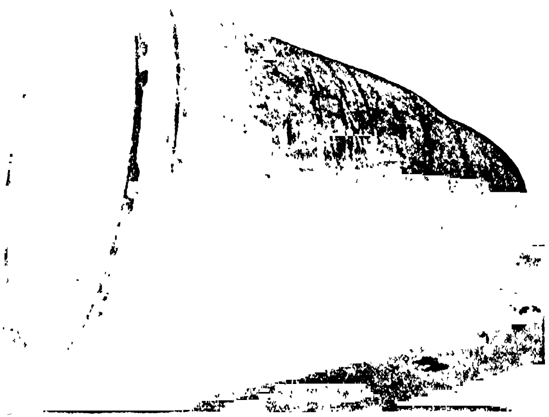
FORGE AND HAMMER WELDED SHAPES

Uses—Practically every manufacturing field has use for forge and hammer welded work. As there are so many types of equipment, only a few are given below, but they will naturally suggest other uses in your particular field.

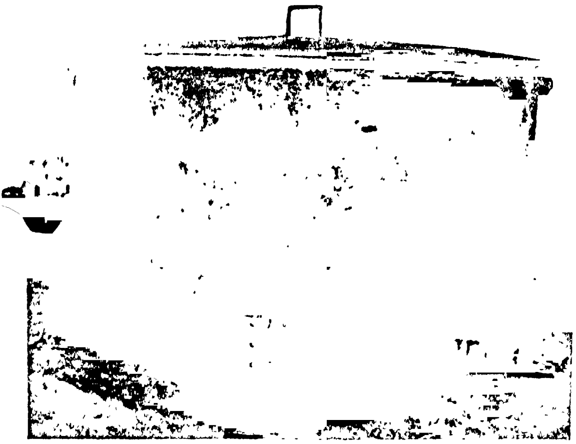
- Air and Gas Receivers
- Boiler Parts
- Carbonic Acid Gas Tanks
- Chemical Plant Parts
  - Acid Eggs
  - Boiling Kettles
  - Crystallizing Pans
  - Digesters
  - Jacketed Kettles
  - Mixed Acid Tanks
  - Nitric Acid Tanks
  - Sulphuric Acid Tanks
- Galvanizing Pans and Kettles
- Oil Filters
- Oil Cracking Stills
- Ice Machine Parts
  - Absorber Shells
  - Ammonia Receivers
  - Condenser Shells
- Lead Melting Pots
- Varnish Kettles
- Vulcanizing Cylinders
- Wood Creosoting Cylinders
- Wood Pulp Digesters
- Steam and Fire Stills
- High Pressure Water Pipe
- Gasoline Tanks

OXY-ACETYLENE AND ELECTRICALLY WELDED PLATE WORK

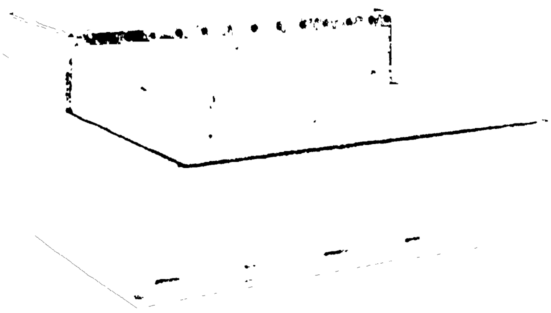
There is an ever increasing demand for Oxy-Acetylene and Electrically welded chemical equipment. This is due to the fact that many new chemical processes being developed and old processes being improved, have for their success been found to depend on high pressures and high temperatures. Operating safety as well as prevention of losses of valuable liquids and gases during processing is obtainable by means of welded high-test equipment.



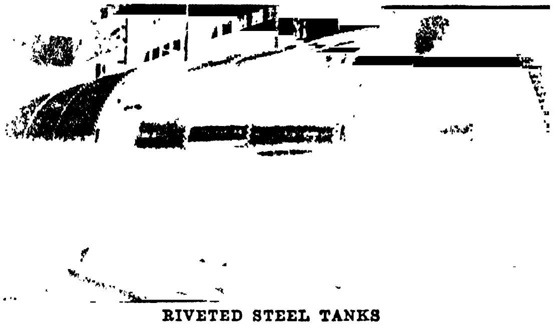
FORGE AND HAMMER WELDED PITCH COKING POT



OXY-ACETYLENE WELDED TANK



OXY-ACETYLENE WELDED TERNE POT



RIVETED STEEL TANKS

RIVETED PLATE WORK

We have specialized for years in riveted plate work that meets every requirement of the chemical industry. The equipment we have built has covered every conceivable design of steel equipment of this class. When plans are submitted to us for quotations engineers can feel assured that we will give the best price commensurate with the thoroughness and reliability of the work produced by this organization.

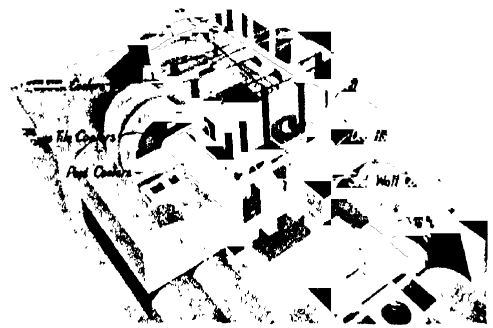
Our engineers are always ready to consult with prospective clients, with regard to the best type of plate work for the conditions to be encountered. There are many operating conditions where riveted steel is more satisfactory than welded or forged equipment.

WATER COOLED APPLIANCE FOR GLASS FURNACES

Blaw-Knox Water Cooled Appliances increase the life of Glass Tanks and Furnaces and enable them to

Continued on Next Page

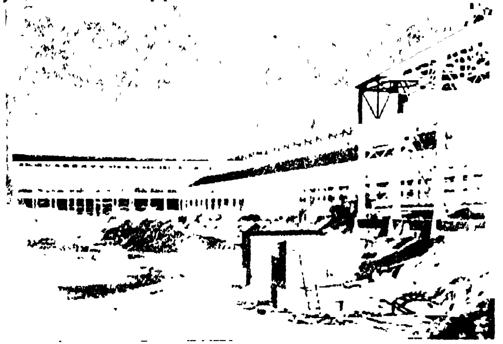
hold their original outlines throughout their run. Greater production and better quality of glass are insured through the use of these coolers; the size of furnace walls can be reduced and heavy, bulky bricking eliminated. Send for catalog covering these products in detail.



WATER COOLED APPLIANCES FOR GLASS FURNACES

FABRICATED STEEL CONSTRUCTION

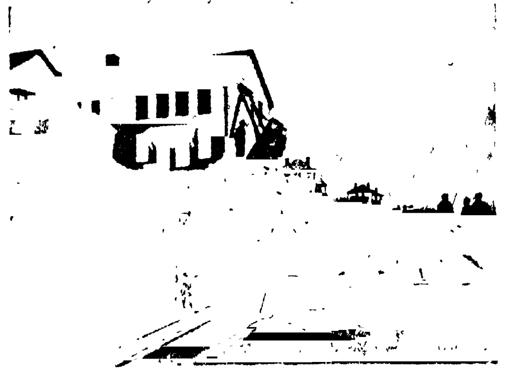
Blaw-Knox engineers have established a reputation as builders of products of merit. Their services and the facilities of a fully equipped and commodious fabricating shop are at your disposal in designing and fabricating mill buildings, manufacturing plants, bridges, steel poles, transmission towers, crane runways, and other types of fabricated steel construction.



FABRICATED STEEL BUILDING CONSTRUCTION

STEEL FORMS FOR CONCRETE CONSTRUCTION

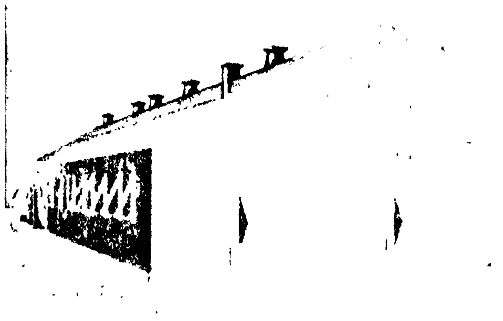
Heavy retaining walls, light walls and foundations, sewers, conduits of any character, columns, floors, roofs, roads, pavements, curbs and gutters, can all be built with greater speed, larger economy and materially better finish through the use of Blawforms. *There is a Blawform for every use.*



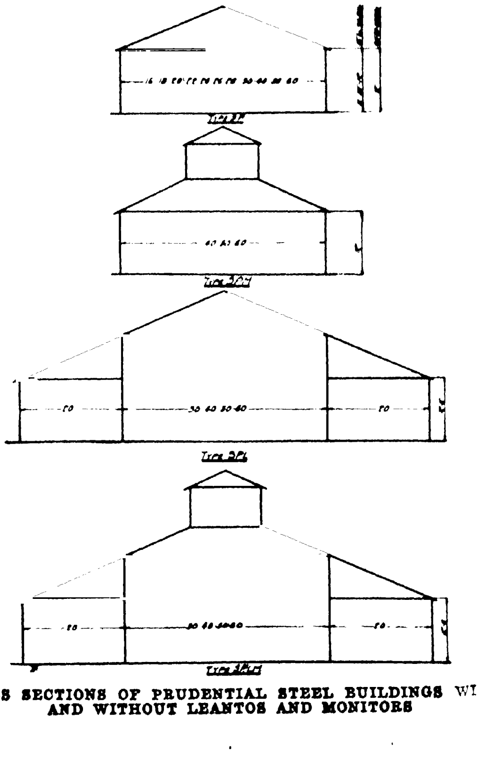
STEEL FORMS FOR CONCRETE

PRUDENTIAL SECTIONAL STEEL BUILDINGS

These buildings are manufactured in widths from 8 to 60 feet single span and in any length. They are carried in stock and can be shipped in a single shipment, which places the complete building on the job and ready for erection without the worry consequent of placing a variety of orders for accessories which is the natural course of events when other types of buildings are contemplated. Heavy, galvanized, specially pressed steel sheeting is used for side walls and roof. The frame is of fabricated construction. All parts fit perfectly. Doors, windows or steel sash, ventilators and skylights may be located at will as the sheets are interchangeable. The sheets are fitted with special interlocking devices and there are no punched holes in side wall or roof sheets. The diagrams below illustrate various types and sizes of Blaw-Knox Sectional Steel Buildings. The line also includes "Quixet" All Steel Garages in single, double and multiplex designs and "Handy Houses" for all purposes. A special catalog fully describes and illustrates the entire line.



PRUDENTIAL SECTIONAL STEEL BUILDING



CROSS SECTIONS OF PRUDENTIAL STEEL BUILDINGS WITH AND WITHOUT LEANTOS AND MONITORS

CHARLES BOND COMPANY

Manufacturers of Power Transmission Machinery

617-619 ARCH ST., PHILADELPHIA, PA.

AFFILIATED COMPANIES

Bond Engineering Works Limited, Toronto Can
Bond Foundry & Machine Company, Manheim Pa
Christiana Machine Co Christiana Pa
J & G Rich Co, 120 122 N Sixth St Philadelphia, Pa

PRODUCTS

Grundy Patent Flexible Couplings.
Power Transmission Equipment.

Hangers	Boxes
Pillow Blocks	Bearings
Floor Stands	Journals
Girder Clamps	Collars
Couplings	Friction Clutches
Leather Belting	Textile Specialties

GRUNDY PATENT FLEXIBLE INSULATED COUPLING

This coupling is constructed of three pieces, two outer flanges of cast iron and a center disc of non-conducting material, with lugs on each side for transmitting the power to the outside flanges.

The central disc is made of specially selected leather, with lugs securely cemented and riveted to each side of the disc.

The larger sizes, Nos. 12 to 30 inclusive, have lugs cemented and bolted on and reenforced with steel plate.

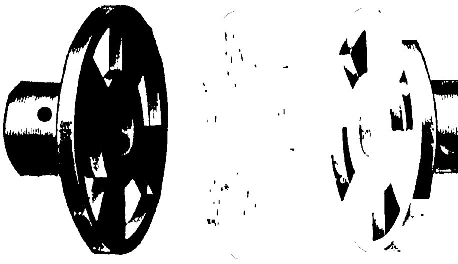


FIG. 77. GRUNDY COUPLING TAKEN APART

The discs supply the insulation while the lugs on each side transmit the power to outside flanges. The leather lugs are **cut on a bias**, tapering towards the disc; the cast iron driving flanges being machined with a corresponding taper, have a tendency to draw the flanges close to the disc, and to cause the leather lugs to receive and transmit the power at their strongest points.

The close connection made possible by this style of coupling reduces to a minimum the leverage, which is so objectionable on the old style pin couplings.

Where it is not possible to get perfect alignment of shafts, this coupling will adjust itself to circumstances.

Give the following information when making inquiries regarding the Grundy coupling:

Horsepower required; revolutions per minute, diameter of driving shaft and size of keyway, diameter of receiving shaft and size of keyway; whether couplings are to be set screwed; whether conditions under which the coupling is to operate are dry or subject to moisture; whether load is constant (if not, write fully regarding intermittent character of same); description of connection for which coupling is to be used.

POWER TRANSMISSION EQUIPMENT

We are prepared to furnish everything required in the line of hangers, couplings, etc., required for the transmission of power to machinery. We also manufacture high class leather belting.

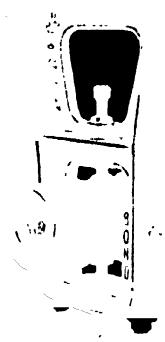


FIG. 1. BOND PATENT UNIVERSAL DROP HANGER

A good rigid hanger, with provisions for free movement in bearing for shaft to revolve Metal is equally distributed in order that there will be sufficient amount where the greatest strain takes place

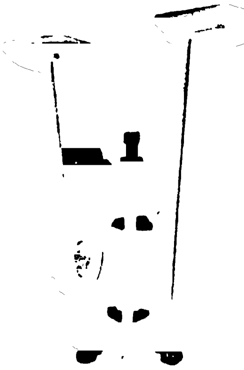


FIG. 17. BOND SCIENTIFIC "LYESTRONG" STEEL SHAFT HANGER

Folded into shape from sheet metal, without breaking the fiber, insuring greatest strength and rigidity

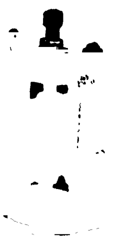


FIG. 4. BOND UNIVERSAL POST HANGER

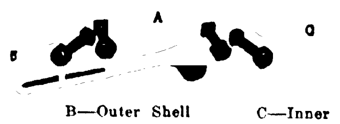
Bearings babbitted and reamed

Fitted with ring oiling bearings, ball and socket adjustment.

FIG. 6. "BOND" PEDESTAL PILLOW BLOCK

Fitted with ring oiling bearings, ball and socket adjustment

Bearings babbitted and reamed



A—Sleeve B—Outer Shell C—Inner Shell

FIG. 42. "BOND" PATENT "SPIRO" COMPRESSION COUPLING

The spiral slot in sleeve makes the Bond a perfect coupling giving a "Double-sure" grip the entire length and circumference of the sleeve. A trial order will convince you of its superiority.

JOHN BOYLE & CO., INC.

Established 1860

112-114 Duane Street
70-72 Reade Street
NEW YORK

BRANCH HOUSE
202-204 Market Street
ST. LOUIS

PRODUCTS: Filter Cloth in a Great Variety of Weaves Suitable for All Branches of the Chemical Industry: Cotton, Wool, Linens, Silks in Rolls also cut and made up to fit any make of Filter Press.

COTTON.

In rolls of about 100 yards, in widths from 14 to 120 inches.

WOOL AND CAMEL'S HAIR.

In rolls of about 50 yards, widths from 6 to 84 inches. Used to resist alkali and acids.

LINENS.

In rolls of about 25 yards, widths from 22 to 28 inches.

SILKS.

In rolls of about 20 yards, widths from 14 to 40 inches.

SERVICES:

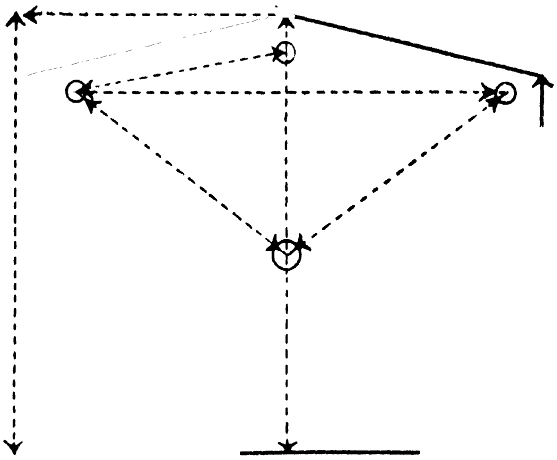
Our experience of years and equipment for making up cloths enables us to properly manufacture them so they snugly fit the plates of your press and thereby obviate the loss of cloths through their being wrinkled on the presses and causing the plates to cut and ruin the fabric when the plates are closed and pressure put on, as is generally the case where cloths are made up without proper care and to a templet.

MADE UP CLOTHS:

We make up cloths to fit your presses.

Send us Blueprint Pattern cloth or measurements of your press together with information regarding material you wish to filter and we can furnish not only the right kind of cloth for your purpose but also ones fitted to your particular press.

MEASUREMENTS REQUIRED:



SKETCH INDICATING REQUIRED MEASUREMENTS

Sketch shows the measurements we require for this particular type of press and will give you an idea as to what measurements we need in order to furnish you with cloths to fit any style of press.

TRIAL ORDERS REQUESTED:

Give us an opportunity to furnish you with a few cloths in order that we may demonstrate why we selling most of the largest firms in the various industries.

THE JAS. A. BRADY FOUNDRY COMPANY

Chemical Castings in Gray Iron

Western Boulevard at 45th Street, CHICAGO, ILLINOIS

PRODUCTS

Special Equipment used in the Chemical Industries including Gray Iron and Special castings for:

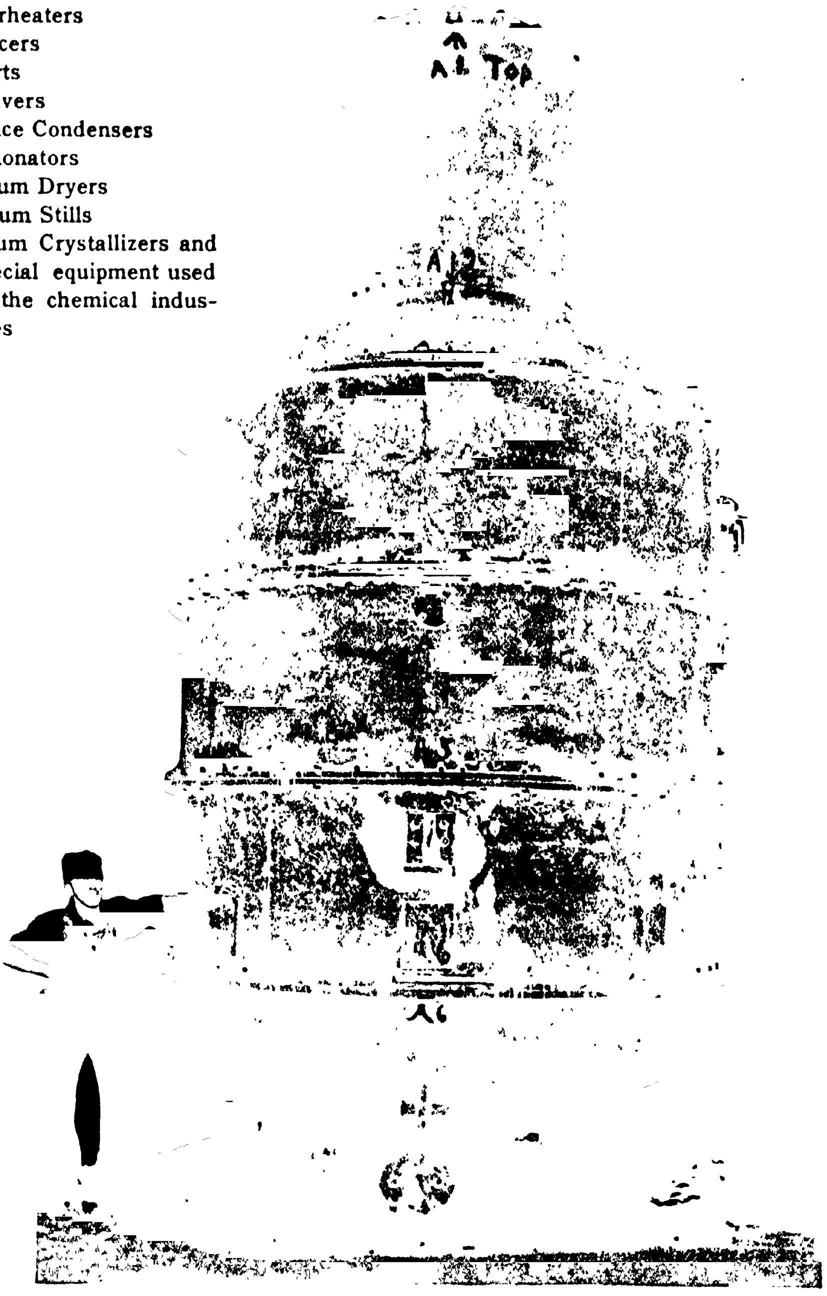
- Acid Eggs
- Autoclaves
- Barometric Condensers
- Concentrators
- Caustic Pots
- Crystalizing Pans
- Denitrators
- Drum Dryers
- Evaporators, in single and multiple effect
- Expansion Tanks
- Extractors
- Filters
- Fusion Kettles
- Naphtha Stills
- Nitrators
- Superheaters
- Reducers
- Retorts
- Receivers
- Surface Condensers
- Sulphonators
- Vacuum Dryers
- Vacuum Stills
- Vacuum Crystallizers and special equipment used in the chemical industries

FACILITIES

This company operates one of the best equipped foundries in the vicinity of Chicago for pouring, handling, and shipping heavy chemical castings. Owing to the character of the work handled by this firm, only the highest grade of gray iron and special mixtures are used. All daylight modern buildings invite the best of workmanship.

CASTINGS

The accompanying illustration represents one of the many castings made by the James A. Brady Foundry Company. This casting is 18 feet 9¾ inches high; each ring section is 3 feet high. The metal is 1½ inches thick and each section weighs 6000 pounds. This casting was made for William Garrigue & Co. for chemical plant use and has a capacity of 1000 pounds of fatty acid per hour.



THIS CASTING REPRESENTS THE WORK WE HANDLE

BRIDGEPORT BRASS CO.

Seamless Tubing

BRIDGEPORT, CONN.

"Bridgeport" TRADE MARK

PRODUCTS

Brass, Bronze and Copper Seamless Tubing, Sheets, Rods and Wire.

Brass, Muntz Metal and Admiralty Condenser Tubes.

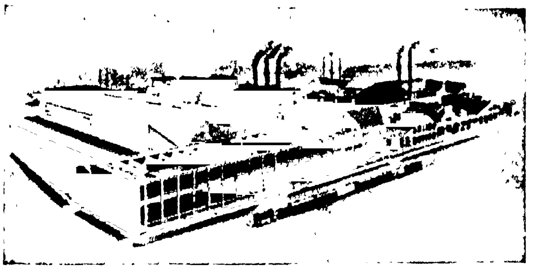
Stamped brass, copper or bronze pans, trays and parts of all descriptions.

Brass screw machine products in all sizes, ¼ inch to 1½inches diameter.

BRIDGEPORT BRASS

An Electric Furnace Product—All Bridgeport brass, as well as Bridgeport bronze, is made in electric furnaces, insuring a uniformity and reliability of properties not otherwise commercially obtainable. For more than fifteen years this company has worked on the development of improved methods of making brass and has developed material improvements in electric furnace processes, which eliminate uncertainty from the process of melting and casting.

Advantages of the Electric Furnace—With the Bridgeport electric process, positive control of temperature is assured at all stages of the melting process, which means that all processes occur at exactly the proper temperatures to insure the best product for the job—be it sheet, rod or tube. Moreover the heating is under perfect control, and can be adjusted at any time to any rate desired. There are no furnace gases to contaminate the metal in the Bridgeport electric process, thus preventing the introduction of undesirable impurities. The charge is completely enclosed so it does not come into contact with the atmosphere.



CASTING SHOP, ROLLING AND TUBE MILLS OF THE BRIDGEPORT BRASS CO.

The heat insulation is perfect, preventing waste of heat by radiation and improving the working conditions of the men who observe the process of melting and control the pouring. The operator has perfect control of the pouring rate through a leverage mechanism permitting him to vary the pouring accurately and as slowly as he wishes without risk of molten metal cooling down in the furnace while pouring.

PHYSICAL PROPERTIES OF BRIDGEPORT BRONZE

Diam. or thickness in inches	Tensile Strength lb per sq. in	Yielding point— lb per sq in	Elongation in 2 inches (per cent)
Up to 1" inclusive	62,000	31,000	25
Over 1" to 2½" inclusive.	60,000	30,000	30
Over 2½" to 3½" inclusive	56,000	25,000	35
Over 3½"................	54,000	22,000	40

SEAMLESS TUBING

The tube mill is remarkable on account of the fact that most of its equipment was developed in the plant by the Bridgeport Brass Company's organization. The quality of the tubes is maintained within very close limits on account of the electric furnace processes used in casting the metal as well as by the studied precision of the methods employed in the tube mill. The life of a tube is largely dependent upon the manufacturing procedure and it was with these points in mind that dies, lubricants, annealing temperatures and other factors which enter into the process were chosen.

BRIDGEPORT SEAMLESS ADMIRALTY—BRASS AND MUNTZ METAL CONDENSER TUBES

Sizes and Weights per Foot

Stubs Gage No	16	17	18	19	20
Thickness, inches.	.065	.058	049	.042	035
Outside diameter in inches					
⅝	420	380	326	283	238
¾	514	463	396	343	289
⅞	608	.547	467	404	339
1	70	63	54	46	39

All Bridgeport tubing is seamless and can be bent to any radius without danger of splitting. Therefore, it is specially suited for use in the construction of heating and cooling coils, tube evaporators, condensers, still coils and miscellaneous piping. Bridgeport brass and bronze tubing is furnished in lengths from 2 to 25 feet, and diameters from ¼ to 5½ inches by eighths.

LABORATORY AND RESEARCH DEPARTMENT

The processes of the Bridgeport Brass Company have been placed on a thoroughly scientific basis through the careful organization of a research laboratory. The work of this department is divided into two parts: the research work and the control routine work.

Research—The research work divides itself into two general classes: namely, work on products of the company and work on materials and equipment employed by the company in the manufacture of its products. The research department develops new alloys, studies details of the manufacturing processes with a view to eliminating wastes, and improving the quality of the product.

Control—The control laboratory systematically samples the product at the various stages of manufacture and performs chemical analyses and certain physical tests, depending on the nature of the product and the particular step in the process from which the sample was taken. In this way, it is possible to control closely the properties of the products passing through the plant. The control laboratory is specially valuable in protecting the various alloys from any impurities that might occur in the ingredients used in their composition.

The Research Department has recently developed methods of making instantaneous tests for measuring certain ingredients in copper alloys. The simplicity of these tests is so great that the company has adopted the practise in some classes of work of testing every heat. In fact, the method is so expeditious that in case a mixture should for any cause be open to question, it is possible to pour a small sample and hold t furnace until the tests are completed. Then if -rections are necessary they can be made befor to furnace is poured.

THE BRISTOL COMPANY

WATERBURY, CONN.

BRANCH OFFICES

Boston
Old South Bldg

New York
114 Liberty Street

Pittsburgh
Frick Bldg

Detroit
Book Bldg

Chicago
Monadnock Bldg

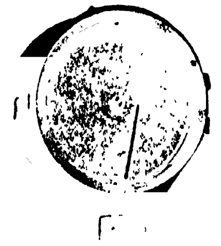
St Louis
Boatmens Bank Bldg

San Francisco
Rialto Bldg

PRODUCTS

Bristol's Recording Pressure, Vacuum, Draft and Combination Gages; Liquid Level Gages; Recording Thermometers; Thermometer-Thermostat; Recording Psychrometers; Indicating and Recording Pyrometers; Electric Temperature Regulators; Recording Voltmeters; Recording Milli-Voltmeters; Recording Ammeters; Recording Shunt Ammeters; Recording Wattmeters; Recording Frequency Meters; Recording Tachometers; Electrical and Mechanical Time Recorders; also, Bristol's Long Distance Electric Transmitting System; Bristol Counters and Bristol-Durand Radii Averaging Instruments.

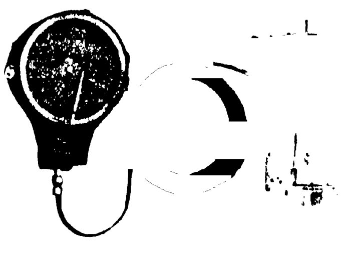
BRISTOL RECORDING PRESSURE AND VACUUM GAGES



RECORDING GAGE

For securing continuous records of pressure or vacuum. For steam, air, gas and liquids. Charts furnished to read in pounds, ounces, inches, feet, metric or any desired unit. For ranges from full vacuum to 12,000 pounds per sq. in. Complete information Catalog AB-1005.

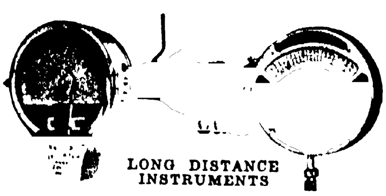
BRISTOL'S RECORDING LIQUID LEVEL GAGES



RECORDING LIQUID LEVEL GAGE

For automatically recording depths or levels of water or other liquids, in tanks, water towers, reservoirs, etc. Instrument can be located where most convenient at a higher or lower level than the liquid to be measured.

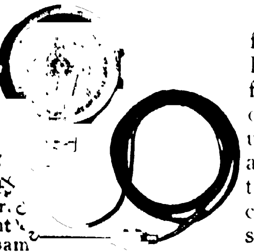
BRISTOL'S LONG DISTANCE ELECTRIC TRANSMITTING AND RECORDING SYSTEM



LONG DISTANCE INSTRUMENTS

For measuring and recording at remote points, pressure, liquid level, temperature and motion. For instance, records may be transmitted over distances of five miles or more.

BRISTOL'S RECORDING THERMOMETERS



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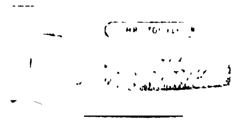
ING THERMOMETER

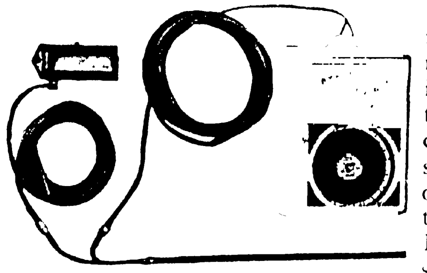
For all commercial ranges from −60° to +800° F. Furnished with plain bulbs for use in open spaces like dry kilns, etc. Bulbs with union and screw connections are supplied for recording temperatures of liquids in close spaces under pressure, such as boiler feed water, superheated steam, milk pasteurizers, etc. For detailed information see Catalogs AB-1102-1202-1302

BRISTOL'S INDICATING AND RECORDING ELECTRIC PYROMETERS



INDICATING PYROMETER

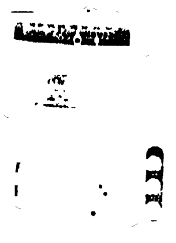
High Resistance Model 319 for ranges up to 3000 degrees Fahr. used with platinum couples.



COMBINATION UNIT OF ELECTRIC PYROMETER

Combination Indicating and Recording Unit of Bristol's Pyrometers furnished where it is desirable to have Indicating Instrument at operators' station and a Recording Instrument for the superintendent in his office.

BRISTOL'S ELECTRIC TEMPERATURE CONTROLLER



TEMPERATURE CONTROLLER

Thermo-Electric Type with automatic electric valves for controlling temperatures in gas, oil and electric furnaces. See Bulletin AB-289.

BRISTOL'S STRIP TYPE RECORDING WATTMETER

BRISTOL'S STRIP TYPE RECORDING WATTMETER

Portable Model for use on poly-phase or single-phase alternating current. Convenient and practical for carrying about to make tests or to obtain records of consumption of electrical energy. For full data see Catalog AB-1500.

BRISTOL'S OPERATION RECORDER

ELECTRIC TIME RECORDER

For recording time of mechanical movements, machine operation, valve reversals, etc.

This Strip Type Electric Time Recorder is designed to record as many as 20 different operations on one chart.

The instrument is easy to install. There are thousands of requirements for this operation recorder in manufacturing plants. For details see Bulletin AB-207.

Established 1854

BROOKLYN FIRE BRICK WORKS

Manufacturers of High Grade Refractories

GENERAL OFFICES
91 Van Dyke Street
BROOKLYN, N. Y.

Telephone HENRY { 13 / 14

PRODUCTS

- **Fire Brick**
- **Special Shapes**
- **Fireseal High Temperature Fire Cement**
- **Fire Clay**

BROOKLYN PATENTED SUSPENDED FURNACE ARCH, FLAT OR CURVED, SLOPED OR STEPPED, UPWARD OR DOWNWARD

We are the sole manufacturers of this Suspended Furnace Arch for all types of Stokers, including underfeed, Traveling Chain Grates or V. Types.

The Suspended Furnace Arch is also adapted to incinerators, Dutch Ovens, Destructors, as well as for Preheating, Reduction, Drying, Chemical, Metallurgical or special furnaces of every description

Mechanical Advantages—It is stronger, more accessible, and durable. It is easier and quicker to repair and has fewer parts.

The patented rounded hanger and slot distributes the load properly and eliminates splitting of the blocks

The key blocks permit making all repairs from the under side of the arch. Once the top is built it need never be removed.

BROOKLYN PATENTED BACK CONNECTION ARCH

This type of arch is used on all kinds and sizes of Horizontal Tubular Boilers, etc

Mechanical Advantages—It is simplest and best as it requires merely a piece of 2" pipe and a series of blocks of one type.

It is quickly installed by putting the pipe in place and then setting blocks on it as shown in illustration.

Each block is readily removed by inserting a hook in the hole in rear of any block and lifting it out.

No mortar is required, as they are set in dry, and the expansion joints on ends and sides are filled with asbestos.

Air circulation through the pipe keeps it cool No center hanger is required to counteract sagging from overheating.

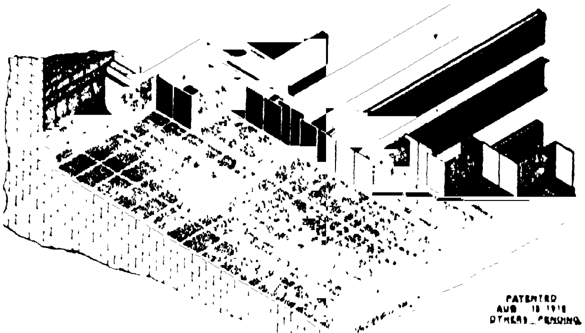
BROOKLYN PATENTED BLOW-OFF PROTECTOR

A series of interchangeable semicircular blocks that interlock in all directions for vertical or horizontal blow-offs.

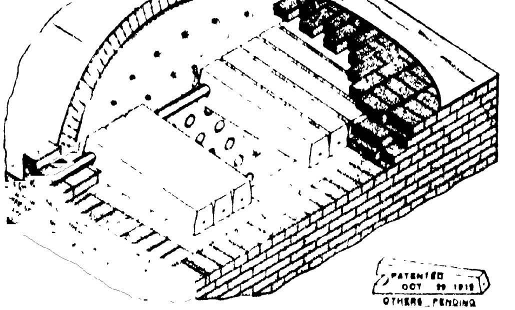
Mechanical Advantages.

Installation Easy—Set dry without clay. Blocks securely interlocked. Only one type required for vertical pipe. This same type block with combination ell and tee for horizontal pipes.

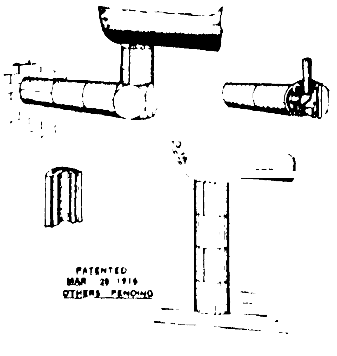
Blocks Thick but not Heavy—They are made from patented mixtures of fire clay that while refractory and highly resistant to spalling are approximately half the weight of ordinary fire brick equivalent.



SUSPENDED FURNACE ARCH



BACK CONNECTION ARCH



BLOW-OFF PROTECTOR

SPECIAL SHAPES

This company has for more than sixty years been specializing in the manufacture of difficult shapes. Where the elimination of joints is a vital factor in the length of life of a lining and where, therefore, special shapes are required, those manufactured by us from the widely known and justly famed Jersey and Raritan Clays will be found to give service superior to those made from any other clays.

BROOKLYN THERMOMETER CO.

Manufacturers

"Brothcom" 50-56 Garden Street "Brothcom"
BROOKLYN, N. Y.

PRODUCTS

"Brothcom" Industrial Thermometers
Barometers, Mercurial and Aneroid
Draft Gauges
Vacuum Gauges
Vacuum Gauges with mercury column
Thermometers
  Etched stem
  Special Precision for checking purposes
  Laboratory Thermometers for general use
  All Glass, long stem, all sizes
Hydrometers and Thermo-Hydrometers for laboratory and industrial work
Mineral Oil Testing Instruments
Sugar Testing Glassware
Chemical Apparatus for Industrial Laboratories and Scientific Institutions
Porcelainware and Fine Chemicals

"BROTHCOM"

This name has been derived from parts of the Company's title and is a guarantee of superior workmanship and careful attention to detail

INDICATING THERMOMETERS NO. 1

Industrial type, mercury filled, made with scale reading from 40 below Zero up to 1000 above. Adaptable for all industrial requirements.

GENERAL REPAIR OF INDUSTRIAL THERMOMETERS

Same repaired in our factory are entirely overhauled and tested—as new ones. Very quick service is offered in this branch of work

MERCURY COLUMN VACUUM GAUGES

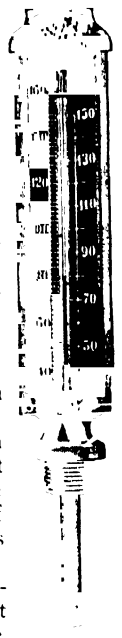
Being made for the close and accurate reading of Vacuum in Steam Plants, where cooking and boiling under vacuum is done.

THERMOMETERS NO. 2

Precision grade, and made with an Etched stem, whether intended for high or low temperature work are made from carefully selected glass of low coefficient of expansion. These thermometers are furnished with or without Bureau of Standards certificate. These certificates can be had at short notice.

Laboratory grade, less expensive instrument suitable where frequent breakage occurs. Carefully made. Can also be furnished with open front armored case.

LABORATORY THERMOMETER No. 2



INDUSTRIAL THERMOMETER No. 1

"BROTHCOM" THERMO-HYDROMETERS NO. 3

As temperature variations affect the density of the liquid and the volume of the Hydrometer, the temperature at which a determination is made is a very important factor in obtaining a correct result.

For Opake liquids our Thermo-Hydrometer has the Thermometer in top of stem for transparent liquids in the body and in each case is so arranged that the Specific Gravity and temperature reading may be taken together.

"BROTHCOM" HYDROMETERS

Laboratory grades have been designed to quickly assume a position of equilibrium in the liquid whose density is required.

To produce this we did away with all resistance offering edges, substituting for the old form of spherical bulb and sharp constructions our superior Arrow Shape finish, thus facilitating Rapid, Accurate reading.

THERMO-HYDROMETER No. 3

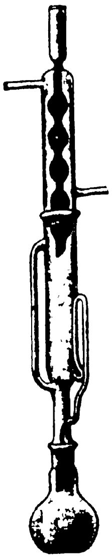
INDUSTRIAL HYDROMETER

INDUSTRIAL HYDROMETERS

These are handwritten, their titles indicating the particular liquids for which their use is intended, and are made for Acids, Alkali, Alcohol, Ammonia, Coal Oil, Glue, Spirit, Sugar, Mineral Oil, Syrup, etc.

"BROTHCOM" LABORATORY APPARATUS

Are of the high type that offer maximum service owing to their durability which comes from using perfect materials in conjunction with high class workmanship. Standard makes of Glass apparatus are always kept in stock for prompt shipments.



SOXHLET EXTRACTION APPARATUS

Established 1854

BROOKLYN FIRE BRICK WORKS

Manufacturers of High Grade Refractories

GENERAL OFFICES
91 Van Dyke Street
BROOKLYN, N. Y.

Telephone HENRY { 13 / 14

PRODUCTS

- Fire Brick
- Special Shapes
- Fireseal High Temperature Fire Cement
- Fire Clay

BROOKLYN PATENTED SUSPENDED FURNACE ARCH, FLAT OR CURVED, SLOPED OR STEPPED, UPWARD OR DOWNWARD

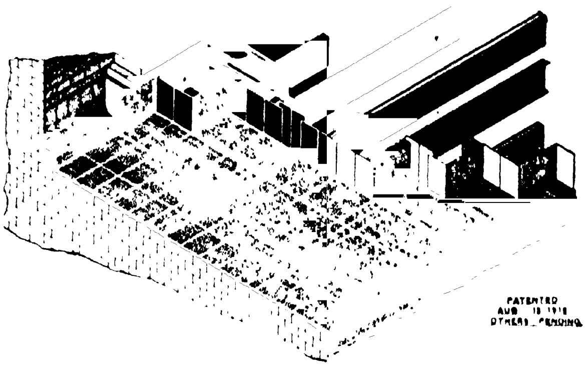
We are the sole manufacturers of this Suspended Furnace Arch for all types of Stokers, including underfeed, Traveling Chain Grates or V. Types.

The Suspended Furnace Arch is also adapted to incinerators, Dutch Ovens, Destructors, as well as for Preheating, Reduction, Drying, Chemical, Metallurgical or special furnaces of every description

Mechanical Advantages—It is stronger, more accessible, and durable. It is easier and quicker to repair and has fewer parts.

The patented rounded hanger and slot distributes the load properly and eliminates splitting of the blocks

The key blocks permit making all repairs from the under side of the arch. Once the top is built it need never be removed.



SUSPENDED FURNACE ARCH

BROOKLYN PATENTED BACK CONNECTION ARCH

This type of arch is used on all kinds and sizes of Horizontal Tubular Boilers, etc

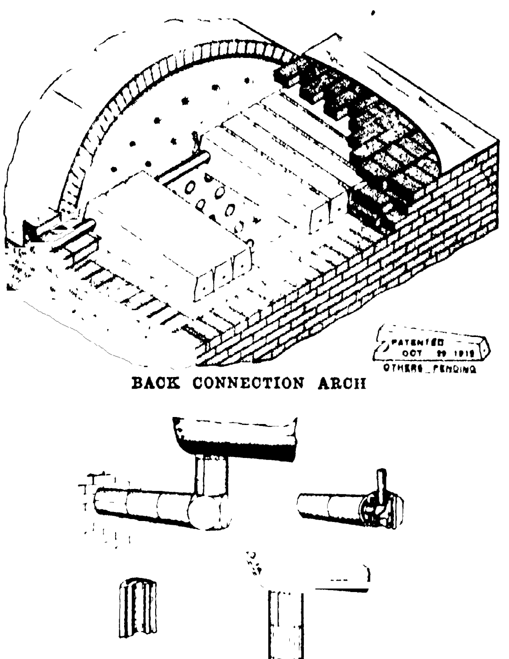
Mechanical Advantages—It is simplest and best as it requires merely a piece of *2"* pipe and a series of blocks of one type.

It is quickly installed by putting the pipe in place and then setting blocks on it as shown in illustration.

Each block is readily removed by inserting a hook in the hole in rear of any block and lifting it out.

No mortar is required, as they are set in dry, and the expansion joints on ends and sides are filled with asbestos.

Air circulation through the pipe keeps it cool No center hanger is required to counteract sagging from overheating.



BACK CONNECTION ARCH

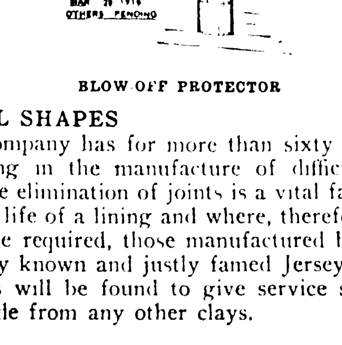
BROOKLYN PATENTED BLOW-OFF PROTECTOR

A series of interchangeable semicircular blocks that interlock in all directions for vertical or horizontal blow-offs.

Mechanical Advantages.

Installation Easy—Set dry without clay. Blocks securely interlocked. Only one type required for vertical pipe. This same type block with combination ell and tee for horizontal pipes.

Blocks Thick but not Heavy—They are made from patented mixtures of fire clay that while refractory and highly resistant to spalling are approximately half the weight of ordinary fire brick equivalent.



BLOW-OFF PROTECTOR

SPECIAL SHAPES

This company has for more than sixty years been specializing in the manufacture of difficult shapes. Where the elimination of joints is a vital factor in the length of life of a lining and where, therefore, special shapes are required, those manufactured by us from the widely known and justly famed Jersey and Raritan Clays will be found to give service superior to those made from any other clays.

THE BROWN INSTRUMENT COMPANY

Pyrometers, Thermometers and Recording Instruments

PHILADELPHIA, PA.

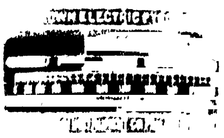
BRANCH OFFICES

New York 50 Church Street
Denver 1712 Champa Street
San Francisco 576 Mission Street
Cleveland Reliance Bank Bldg
Pittsburgh, Oliver Building
Chicago, Conway Building
Montreal, Canada, 414 St James St
Detroit, Ford Building
St Louis, Railway Exchange Building
Los Angeles 363 New High Street

PRODUCTS

Pyrometers; Thermometers; Gauges; Tachometers and other Scientific Instruments.

PYROMETERS



HIGH RESISTANCE INDICATING PYROMETER

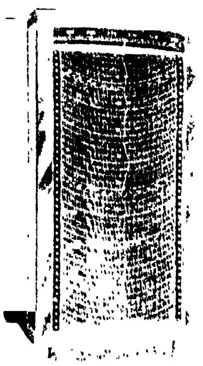
High Resistance Indicating Type—For measuring temperatures from 300° to 3000 Fahr or equivalent Cent.

Operates on thermo-electric principle. Entirely unaffected by temperature changes along wire connecting thermocouple to instrument.

Also designed to automatically control or regulate temperatures of electric, gas or oil furnaces.

RECORDING PYROMETER

High Resistance Recording Type—Keeps a continuous record, day and night, of temperatures. Eliminates guesswork Gives executive a check on plant operation.



CONTINUOUS RECORDING PYROMETER

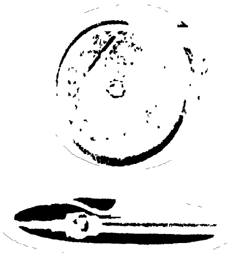
Continuous Recording Type—Makes a continuous record of temperatures over a 2 months' period. It requires only the winding of 8-day clock mechanism once a week. Made in types to record the temperature of 1, 2, 4, 6, 8 or 10 thermocouples in different colors on one chart.

Portable Type—Made in both high and low resistance types. Height 7 in., width 7 in., depth 4½ in., weight only 6½ lbs.

PORTABLE PYROMETER

THE NEW BROWN RECORDING THERMOMETER

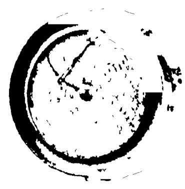
For measuring temperatures up to 800° Fahr. Operates on the principle of expansion of gas or liquid with change of temperature. Tubing can be 100 ft. long. Readings are unaffected by atmospheric changes in temperature along tubing or at instrument. Makes a clear, accurate chart.



RECORDING THERMOMETER

RECORDING PRESSURE GAUGE

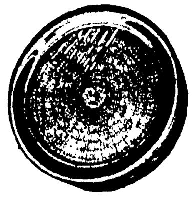
For recording all ranges of vacuum and pressure from a few ounces of water to 3000 lbs Operate through expansion or contraction of a helical hollow spring for high pressure and a series of diaphragms for lower pressures and vacuums Positive and accurate.



RECORDING PRESSURE GAUGE

TIME AND OPERATION RECORDER

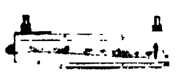
Extensively used for recording the time of operation of machinery, switches, valves, pumps and for recording the reversals of glass melting tanks, open hearth furnaces and annealing furnaces. Also for recording the time of starting and stopping of paper machines and other devices.



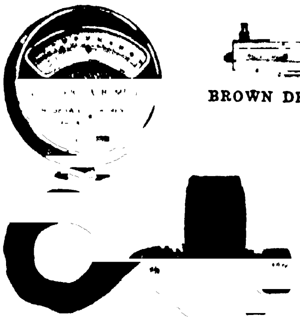
TIME AND OPERATION RECORDER

OTHER BROWN INSTRUMENTS

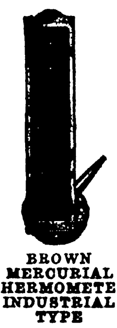
Ammeters; draft gauges, electrical tachometers, mercurial tachometers; mercury gauges; milli-ammeters; milli-voltmeters; recording gauges; temperature controllers; mercurial thermometers; vacuum gauges; voltmeters; differential gauges.



BROWN DRAFT GAUGE



BROWN ELECTRIC TACHOMETER



BROWN MERCURIAL THERMOMETER INDUSTRIAL TYPE

BROWN PORTABLE CONVEYING MACHINERY CO.

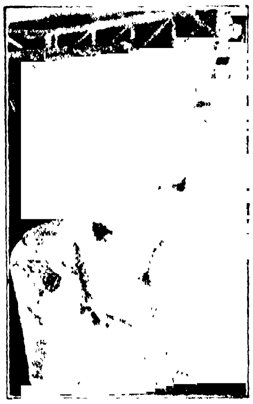
10 SOUTH LA SALLE ST., CHICAGO, ILLINOIS, U. S. A.

Sales Representatives in All Parts of the World

PRODUCTS

Elevators, Conveyors, Loaders, Unloaders for the Economic Handling of Packed and Loose Materials.

PILING MACHINES



ONE TYPE OF PILING MACHINE

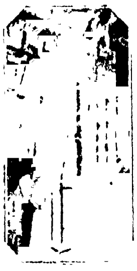
Designed and built to fit any reasonable condition. Carriages, size, and strength varied to suit local requirements. Practically any commodity provided for. Brown Portable Pilers pile the highest tier as cheaply, quickly and easily as the lowest. Pile up to 30 feet. Eliminate hard work, slowness and time-wasting. Adjustable in height, readily portable, driven by gasoline or electricity — and thoroughly guaranteed.

"INTERVEYOR"

SECTIONAL CONVEYOR
(Interveyor)

A system of portable horizontal conveyor sections, combined when necessary with a piling machine, which carry goods of all descriptions any distance — around corners when required—into cars, to the top of the pile or elsewhere. Sections are easily portable, readily removable and interchangeable.

VERTICAL ELEVATORS



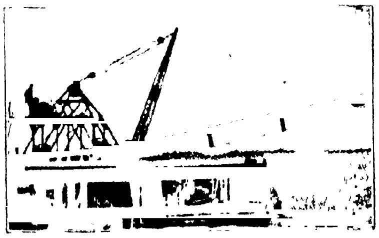
VERTICAL ELEVATOR

In both electric and hand power types. Make every inch of warehouse space available without additional labor or time. Hinged to clear doorways and other obstructions. Made in various sizes and capacities to elevate up to 2000 lbs. per load. Fast, reliable and safe. Portable.

PORTABLE BELT CONVEYOR

PORTABLE BELT CONVEYORS

Continuously moving belt carries bulk materials as rapidly as they can be placed on belt. Unusually low receiving end allows placing under hopper of drop-bottom cars. Unloads cars, loads trucks and wagons, and piles with 25% the labor and time of the hand-and-shovel method. Readily portable.



BARGE UNLOADER

CAR, TRUCK AND BOAT LOADERS AND UNLOADERS

Designed and built in every case to meet the individual conditions. Varying water levels, different types of boats and miscellaneous commodities hold no terror for "Brown-Portable" engineers.

FACILITIES

CAR LOADER

Eighteen years of specialized experience in the design and manufacture of portable handling machinery, coupled with the prestige of being the originators of and the leading specialists in portable and sectional handling appliances, are the strongest guarantees that can be offered on behalf of the perfect operation and long life of "Brown-Portable" products. Bulletin No. 167-A gives interesting facts on the important subject of "Cutting Handling Costs." It is sent to any address without cost or obligation.

VYNUL HARBAGE
President

FRANK J. MURRAY
1st Vice-President

P. R. PERKINS
Secretary

G. A. HANKINS
Treasurer

THE BUCKEYE DRYER COMPANY, Inc.

Engineers and Manufacturers of Dryers for Industrial Use

243 North High Street
COLUMBUS, OHIO, U. S. A.

REPRESENTATIVES

NEW YORK, N. Y.
B. P. Goldman, M. E., 220 W. 42d Street

DENVER, COLO.
The Dry Milling Engineering Co., Boston Building

PRODUCTS

Dryers - Six Types - A Dryer for Every Purpose.

ADVANTAGES OF BUCKEYE DRYERS

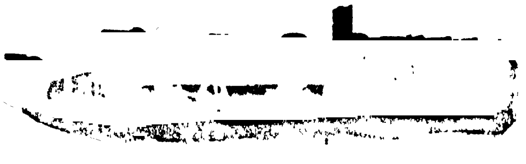
Capacity, Fuel Economy, Thoroughness in Construction, Economy in Operation and Maintenance.

Tires, Rollers, Gears and all Wearing Parts made of steel

TYPE A

A Dryer suitable for drying Packing House Tankage, Sewage Sludge Cake, Garbage, etc. Preferably materials carrying moisture between 40% and 90%.

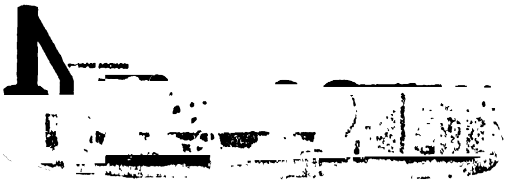
Extensively used by Packing Houses for drying Tankage, Blood, Steamed Bone, etc., and by Cities for drying Sewage Sludge, Garbage, etc.



TYPE B

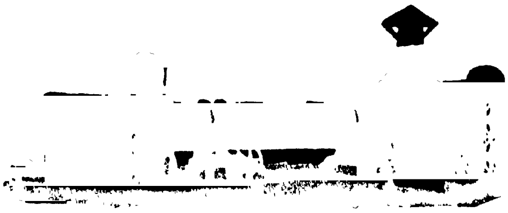
A Dryer suitable for drying Pressed Tankage, Blood, Stock Feed, Canning House Waste, Coal, Concentrates, Salt, Peat, etc. Preferably materials carrying moisture between 10% and 60%.

Extensively used for drying Coal for Powdered Coal Plants, Canners' Wastes, Salt, Paint Materials, Pressed Tankage, etc.



TYPE C

A Dryer specially adapted to drying High Grade Butter and Cheese Salt, Sensitive Materials which cannot be subjected to direct contact with the products of combustion from the furnace, or where it is desired to make use of waste heat from power plant

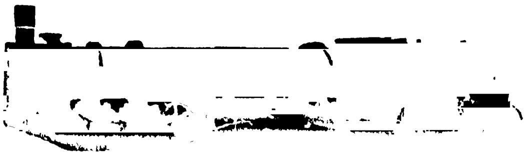


TYPE D

A Dryer specially adapted to drying of Stock Feeds from Starch Houses, Brewers' Grains, Beet Sugar Factories, etc.

Extensively used for drying Beet Pulp and Potatoes.

Exceptional Capacity.

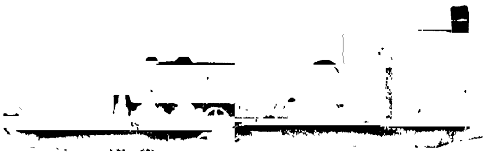


TYPE E

A Dryer where the drying agent is air heated by a bank of steam coils before being blown through the dryer.

Suitable for drying Chemicals, Borax, Baking Powder, etc., requiring a low temperature.

Exhaust steam can be made use of for heating the coils of this type of dryer when desired.



TYPE G

A Plain Shell Dryer suitable for drying any material not susceptible to injury by overheating, such as Rock, Sand, Gravel, Ores, etc.

SOME USERS OF BUCKEYE DRYERS

Morris & Co., Wilson & Co., Goodyear Tire and Rubber Co.
Morton Salt Co., Carey Salt Co., Mulkey Salt Co.,
Pennsylvania Salt Mfg. Co., Colonial Salt Co.,
Milwaukee, Wis., and Houston, Tex., Sewage Plants,
Miller Rubber Co., Marine Products Corp., Gilligan, Chipley Co.

During the year 1920, 60% of our business consisted of repeat orders from large concerns, who, after trying out many machines, adopted Buckeye Dryers.

BROWN PORTABLE CONVEYING MACHINERY CO.

10 SOUTH LA SALLE ST., CHICAGO, ILLINOIS, U. S. A.

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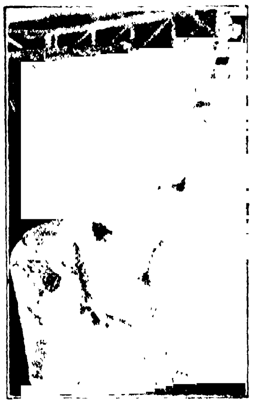

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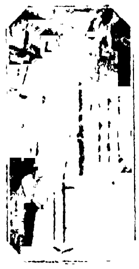

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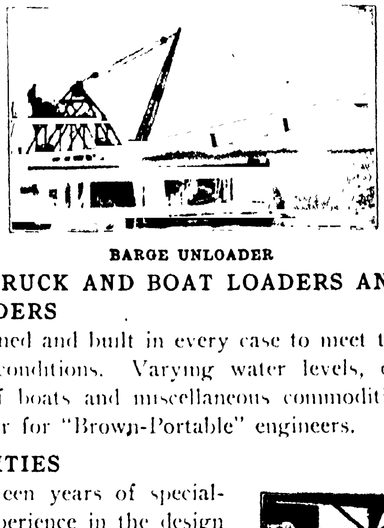

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BUFFALO FOUNDRY & MACHINE COMPANY

Vacuum Dryers, Evaporators, Chemical and Sugar Apparatus

NEW YORK OFFICE
17 Battery Place

1575 FILLMORE AVENUE, BUFFALO, N. Y.

Cable Address
"BUFOUNDRY"

PRODUCTS

"Buflovak" Vacuum Drying Apparatus

- Vacuum Drum Dryers
- Vacuum Shelf Dryers
- Vacuum Rotary Dryers
- Impregnating Apparatus
- Dry Vacuum Pumps
- Surface Condensers
- Barometric Condensers
- Expansion Tanks
- Solvent Recovery Apparatus

"Buflovak" Evaporators

- Horizontal Tube Evaporators
- Vertical Tube Evaporators
- Rapid Circulation Evaporators
- All Cast-Iron Evaporators
- Crystallizing Evaporators
- High Concentrators
- Causticizing Apparatus
- Caustic Recovery Apparatus
- By-Product Recovery Apparatus
- Receivers, Salt Filters, Pre-heaters, etc.

Special Evaporating Equipment in steel, copper, bronze, aluminum, all cast iron, and other special metals.

"Buflokast" Chemical Apparatus

- Nitrators
- Reducers
- Reflux Condensers
- Sulphonators
- Vacuum Stills
- Drum Dryers
- Autoclaves
- Caustic Pots
- Caustic Flakers
- Fusion Kettles
- Beta-Naphthol Stills
- Phenol Stills
- Vacuum Ovens
- Nitric Retorts
- Denitrators
- Acid Eggs
- Crystallizers
- Jacketed Kettles
- Nitric Acid Plants
- Concentrating Apparatus for Nitric, Sulphuric and Hydrochloric Acids
- Recovery Systems for Nitric and Sulphuric Acids
- Acid-Resistant Castings
- Special Chemical Castings

"Buflovak" Sugar Apparatus

- Diffusion Batteries
- Pulp Catchers
- Vacuum Pans
- Vacuum Dryers
- Vacuum Pumps
- Steam Separators
- Sand Filters
- Bone Black Filters
- Bone Black Dryers
- Heaters
- Evaporators
- Catchalls
- Condensers
- Coolers
- Bag Filters
- Filter Presses
- Granulators
- Crystallizers
- Kilns
- Retorts
- Mixers
- Juice Heaters

RESEARCH LABORATORIES

By means of these laboratories, opportunities are afforded for making practical tests in each type of dryer and evaporator, and in various types of chemical and other apparatus. This experimental work is conducted without charge or obligation, except for furnishing the necessary materials and paying transportation expenses.

Engineering and Consultation

Our organization includes a corps of mechanical, metallurgical, chemical, vacuum, and sugar engineers, whose services for advice and consultation are placed at your disposal.

Some of the fields covered are:

- Drying and Evaporating
- Heavy chemicals, acids, and high explosives
- Organic chemicals, dyestuffs, coal-tar intermediates, etc
- Caustic soda, potash and other alkalis
- Sugar apparatus
- Special castings for chemical, heat resisting and other purposes

VACUUM DRUM DRYER

The "Buflovak" Vacuum Drum Dryer is used for converting liquids into dry form. Owing to the high vacuum and the consequent low temperatures employed, the most delicate materials may be dried with the utmost safety as all danger of overheating or other injury is avoided. The operation is practically continuous and automatic. The apparatus consists of a hollow heated drum revolving in a sealed casing provided with devices for applying the liquid to and removing the dry material from the drum. Steam, hot water or other heating medium is supplied to the interior of the drum. A high vacuum is maintained in the casing by means of a high efficiency dry vacuum pump and consequently the material is dried at an extremely low temperature

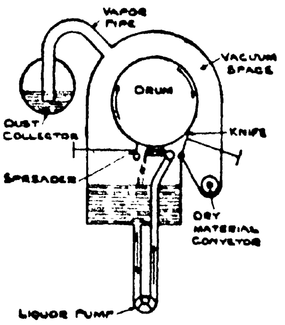
"BUFLOVAK" VACUUM DRUM DRYER

Used for drying solutions such as Dyewood, Tannin, Pharmaceutical and other Extracts; Glues, White Lead, Milk, Eggs, Serum, Liquid Foods, Coffee, Chemical Solutions, and other liquids containing solids.

Continued on Next Page

VACUUM DRYING APPARATUS: Continued

VACUUM DRUM DRYER: Continued



CROSS-SECTION OF "BUFLOVAK" VACUUM DRUM DRYER SHOWING INTERIOR ARRANGEMENT

The liquid is applied to the drum by our patented automatic device which produces a uniform coating on the drum and consequently a uniform dry product. Foaming, viscosity or other characteristics of the liquid do not affect the uniformity of the dry product, because the drum is entirely clear of the body of liquid as shown in the drawing.

While the vacuum drum dryer has in theory been considered the ideal apparatus for drying liquids, satisfactory commercial results were not obtained until our patented devices for applying the liquid to the drum were perfected. Where the drum dips into the main body of the liquid it is impossible to maintain a constant level on many materials, due to the agitation and foaming of the liquid. This change in level makes a corresponding change in the amount of drum surface dipping in the liquid, which varies the moisture content of the finished product, interrupts the continuous operation of the dryer, reduces the output, and increases the cost of operation.

Where the dry material can be mechanically conveyed, two receivers are provided, which enable the dryer to be operated continuously, a conveyor being employed to deliver the material to one receiver while the other receiver is being emptied. Where the nature of the material requires batch operation, a single receiver of large capacity is used.

All sizes are so constructed that they may be cleaned and kept in sanitary condition. A man can enter the casing of the larger sizes and scour all parts of the interior. The smallest dryer is so constructed that the casing over the drum can be readily moved back and free access had to all parts.

"BUFLOVAK" VACUUM DRUM DRYER—NO. 1 SIZE

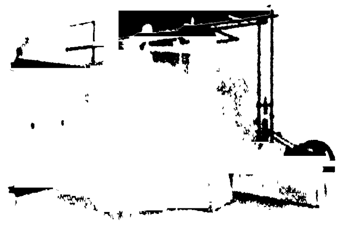
Designed for drying smaller quantities of liquid materials than can be handled economically in our larger apparatus Also makes a valuable laboratory drum dryer

ATMOSPHERIC DRUM DRYER

For drying liquids that do not require a vacuum, our atmospheric type, which embodies the patented principles and devices of the vacuum type, is recommended. Only a small part of the drum surface comes in contact with the wet material, which means greater drying area and low cost of drying.

ATMOSPHERIC DRUM DRYER

VACUUM SHELF DRYER


"BUFLOVAK" VACUUM SHELF DRYER

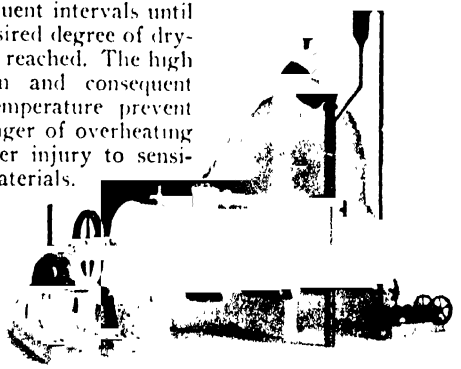
The "Buflovak" Vacuum Shelf Dryer is adapted to the drying of materials that are best handled in pans or trays. The dryer consists of a rectangular chamber containing hollow shelves, steam or hot water heated, on which are placed the pans or trays containing the material to be dried. If desired, the volatile matter or solvents removed from the material may be reclaimed. This type of dryer is used very extensively in many industries and is adapted to the drying of a great variety of materials.

A distinctive feature of the "Buflovak" Vacuum Shelf Dryer is the construction of the chamber casting which in all sizes is made in one piece. This eliminates many joints which would otherwise be necessary. This feature, combined with the special quality of metal used, insures a high vacuum and consequently extremely low temperature in the apparatus, so that all materials may be dried without any danger of overheating, oxidation or other injury.

These dryers are built in many sizes and it is possible to accommodate any required capacity.

VACUUM ROTARY DRYER

This apparatus is used for drying materials that permit agitation or mixing. The material is kept in constant motion by means of revolving arms, attached to the center heating tube, so that the material comes in contact with the heating surfaces, either the steam jacket or the center tube, at frequent intervals until the desired degree of dryness is reached. The high vacuum and consequent low temperature prevent all danger of overheating or other injury to sensitive materials.


"BUFLOVAK" VACUUM ROTARY DRYER

IMPREGNATING APPARATUS

For drying various materials and impregnating them with insulating, waterproofing, fireproofing, coloring and other compounds. Used for insulating electric coils, cables, transformers, etc.; impregnating wood with stain or color for producing imitations of other woods.

IMPREGNATING APPARATUS

Continued on Next Page

VACUUM DRYING APPARATUS: Continued

DRY VACUUM PUMP

"BUFLOVAK" DRY VACUUM PUMP

The success of "Buflovak" Vacuum Apparatus is partly due to the efficiency of "Buflovak" dry vacuum pumps which are designed for the most exacting service. After their experience with other makes, our customers invariably express astonishment at the high vacuum produced and maintained with these pumps. Built in many sizes single- or two-stage—steam, belt or motor driven.

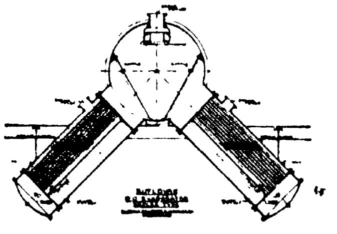
"BUFLOVAK" EVAPORATORS

Rapid Circulation Evaporators—Especially adapted for concentrating and distilling solutions which should not be exposed to heat except for the shortest possible time; also for solutions that have a tendency to foam or produce scale. The amount of liquor in circulation is very small and the possibility of foaming is reduced to a minimum as the liquor level is always kept low and the foam is broken up in the upper part of the tubes where film evaporation takes place.

This evaporator can be operated with very small temperature differences, on which account it can be used in multiple effects of many units, which makes for high economy in steam consumption and large quantity of liquor handled.

INCLINED TYPE

A special advantage of the inclined type is the accessibility of the tubes and the interior of the vapor body. By simply opening a door in the bottom of the evaporator the tubes are easily reached from the outside for cleaning. However, the high speed of the liquor (100 feet or more per second) has a scouring effect upon the tubes and helps to keep them clean. The interior of the vapor body is easily reached through a manhole in the side. Where a large heating surface is required each effect can be constructed with two steam chests attached to the vapor body as shown in the drawing of the duplex type, which also shows the general arrangement of the vapor body, steam chest and tubes.



"BUFLOVAK" DUPLEX TYPE RAPID CIRCULATION EVAPORATOR

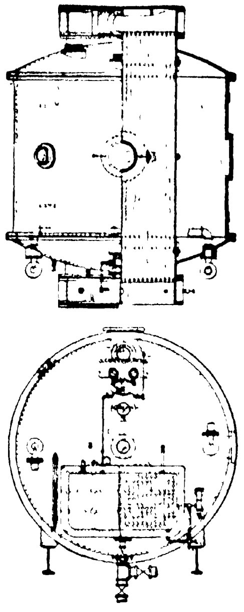
EVAPORATORS: Continued

RAPID CIRCULATION EVAPORATOR, Vertical Type

"BUFLOVAK" VERTICAL TYPE RAPID CIRCULATION EVAPORATOR

The construction of this type has been developed from the standard vertical tube evaporator, the length of tubes being increased and the liquor space being reduced. The rapid circulation of the liquid prevents overheating so that the most delicate liquors can be handled with the utmost safety. The special baffle and tube arrangement eliminates losses caused by foaming and entrainment. The solution circulates at such a velocity that it tends to scour the tubes, thereby reducing the amount of cleaning on some materials and eliminating it almost entirely on others. When mechanical cleaning becomes necessary the tubes are easily reached by removing a cover plate at the top of the evaporator, which permits cleaning from the outside of the equipment without removing the tubes. This evaporator occupies very little floor space and the erection and operation are extremely simple.

HORIZONTAL TUBE EVAPORATOR



PLAN AND ELEVATION

This evaporator is used for common solutions which are distilled or concentrated to higher densities without the separation of salts and which have no tendency to foam or produce scale. The evaporator body consists of a horizontal cylindrical shell closed at both ends with spherical heads. Ample resistance to inside or outside pressures is thus assured without the necessity of excessive wall thicknesses as in the case of the rectangular shell constructed of flat plates.

The large downtake on each side of the tube nest allows a rapid and uniform circulation through all parts of the heating surfaces. Losses by entrainment have been overcome by making the width of the evaporator body (above the liquor level) about twice the width of the tube nest, which reduces the vapor speed. The shells are made in one piece up to 12 feet long, consequently the number of joints and the chances of leakage are less than in any other type.

An important feature of this construction is the possibility of enlarging the evaporator by simply adding another cylindrical shell and providing longer tubes, thus avoiding the necessity of installing entirely new equipment when greater capacity is needed.

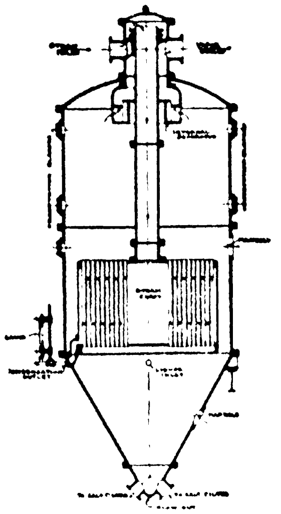
Continued on Next Page

EVAPORATORS: Continued

VERTICAL TUBE EVAPORATOR

This evaporator is of the crystallizing type and is used with salt filters for evaporating and crystallizing solutions containing salts which become insoluble during concentration.

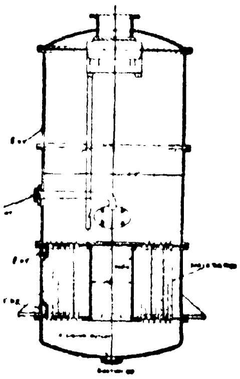
The steam chest is of the floating type, forming a separate unit instead of being an integral part of the evaporator body. The floating type steam chest with the annular downtake, affords a rapid recirculation of the solution which is a necessary aid in depositing the salt in the filters.



VERTICAL TUBE EVAPORATOR

VERTICAL TUBE FINISHING PAN FOR MALT EXTRACTS AND OTHER SYRUPS

This evaporator is designed for heavy concentration of malt extracts and similar syrups to 80° Balling. The construction of the pan is such that the actual contents is small and the liquor is not in contact with the heating surface longer than is absolutely necessary. The tubes are kept clean and sanitary by the rapid circulation of the liquor, which eliminates overheating and prevents coating of the tubes.



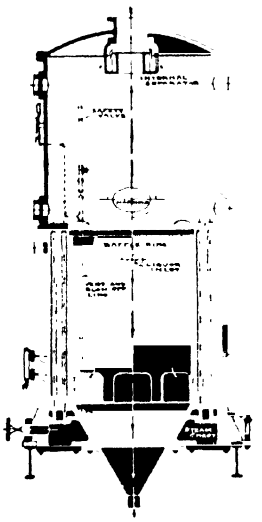
INTERIOR ELEVATION VERTICAL TUBE FINISHING PAN

HIGH CONCENTRATORS

Especially adapted to the high concentration of caustic soda, potash, ammonium nitrate and electrolytic caustic solutions above 36° Bé. This evaporator produces a very rapid circulation of the liquor, and is designed for concentrating liquors to higher densities than are practicable in other types.

The tubes are made of alkali-resisting or acid-resisting iron, copper, or special bronze, depending on the nature of the liquor to be concentrated.

Furnished in single or multiple effects, with or without salt separation.

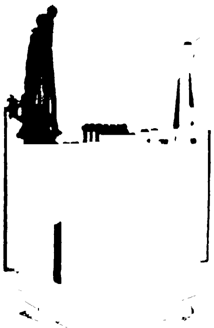


"BUFLOVAK" HIGH CONCENTRATOR

"BUFLOKAST" CHEMICAL APPARATUS

This line includes apparatus for producing heavy chemicals, acids, caustic soda and other alkalis, organic chemicals, high explosives, coal tar intermediates, etc. Apparatus furnished for all standard chemical operations, such as nitration, denitration, reduction, sulphonation, chlorination, distillation, crystallization, caustic fusion, etc. Complete plants furnished for manufacturing many chemical products.

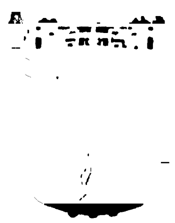
"BUFLOKAST" NITRATOR, HOUGH TYPE



"BUFLOKAST" NITRATOR

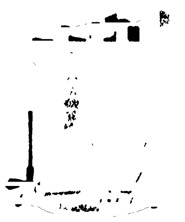
This nitrator was designed to obtain a high yield and large output with a high degree of safety in operation. These features have been made possible by providing for control of the temperature at the point of reaction, and the rapid incorporation with the acids of the reacting chemical compounds. A notable feature is the rapid circulation of the acid which prevents any appreciable rise in temperature at the point of contact of the hydrocarbon and the acid. The safety devices employed make it possible to conduct nitrations much faster and secure a far greater output than with any other type ever used.

This apparatus can be used with equal efficiency and safety for nitrating, reducing, sulphonating, chlorinating and other chemical operations. Also adaptable for mixing, blending and washing oils. Special type for nitrating glycerine.



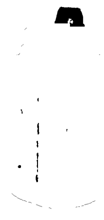
NITRATOR

Provided with cooling jacket, tubes, or both. Temperature of each tube individually controlled.



REDUCER

Noted for large output, and for ease and cleanliness of operation. Furnished with or without jacket

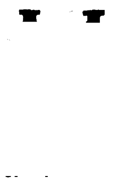


SULPHONATOR

Construction especially heavy and durable. Designed for effective agitation.

CAUSTIC POT

FUSION KETTLE



ACID EGG

Caustic pots and fusion kettles are constructed of special metal noted for its success in withstanding combined action of caustic and high temperature.

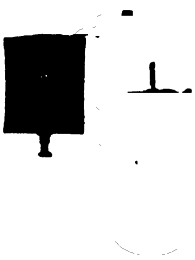
Vertical and horizontal types. Sizes, 25 to 1000 gals capacity.

Continued on Next Page

CHEMICAL APPARATUS:
PHENOL (Carbolic Acid) STILL

Noted for simplicity in design and durability in service. Equipped with special device for deodorizing the vapors that pass from the still to the condenser. Condenser is arranged for water supply at the bottom and overflow at the top, and fitted with a special coil to prevent discoloration of the acid.

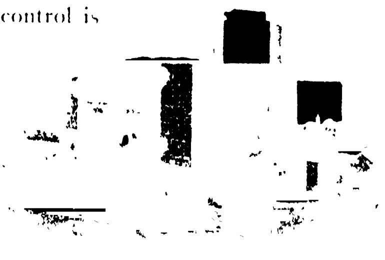
Built in various sizes up to 1,000 gallons capacity.



"BUFLOKAST" PHENOL STILL

DIRECT HEAT SHELF RETORT

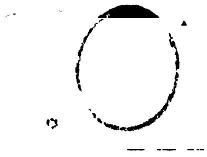
Operated with or without vacuum. Especially adapted for reclaiming high boiling point solvents where solid materials must be heated and temperature control is of great importance. Also used in the manufacture of sulfanilic and naphthionic acids and is far more efficient than the type previously used for this purpose.



"BUFLOVAK" DIRECT HEAT SHELF RETORT

NITRIC RETORTS

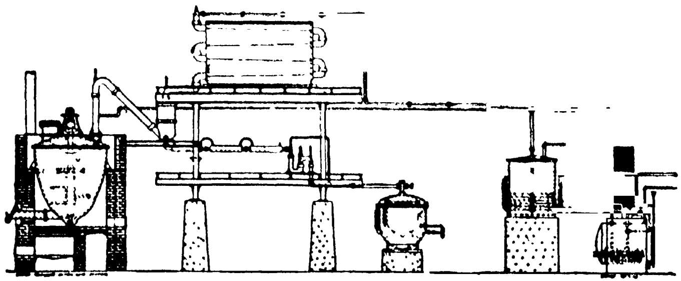
"Buflokast" nitric retorts have long since become a standard unit with most of the high explosive companies and other manufacturers of nitric acid. Especially noted for durability. Designed of such proportions as to give maximum yield per charge with low cost for furnace setting and operation.



"BUFLOKAST" NITRIC ACID RETORT

VACUUM NITRIC ACID PLANT, HOUGH TYPE

Furnished complete with vacuum still, condensing system, pump, bleacher, hydrometer pot, acid receivers, tanks and scrubber. Designed for producing nitric acid of great strength and purity at low cost of production and upkeep. The vacuum operation insures distillation at low temperature and increases the safety and ease of operation.



"BUFLOVAK" VACUUM NITRIC ACID PLANT

NITRIC AND SULPHURIC ACID RECOVERY AND CONCENTRATING APPARATUS

Complete equipment furnished for recovering nitric and sulphuric acids at a high degree of concentration from mixed nitrating acids. A special feature of this apparatus is its compactness, thereby requiring small space as compared with other systems, and a lower capital investment. Other distinguishing features are high operating efficiency and low upkeep cost.

CRYSTALLIZERS

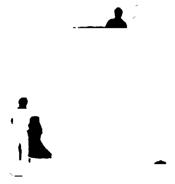
Furnished in the vacuum and atmospheric types. Adapted for concentrating and crystallizing many products, including ammonium nitrate and TNT. The vacuum type is especially adapted for delicate materials requiring low temperatures.

VACUUM CRYSTALLIZER

When furnished in the atmospheric type, the dome is omitted

SPECIAL CHEMICAL CASTINGS

"Buflokast" service also includes the manufacture of special castings for chemical, heat resisting and other requirements. The materials for these castings are carefully analyzed and metal compositions produced with laboratory exactness. The result is a finished casting of known quality with physical and chemical properties suited to the conditions it is to meet.



JACKETED KETTLE

"BUFLOVAK" SUGAR APPARATUS

Our Sugar Machinery Department is under the supervision of engineers who have had many years' experience in designing, constructing and operating sugar machinery, including complete manufacturing plants, in the production of brown, white and refined sugars in the cane and beet sugar fields. This experience, coupled with a broad manufacturing experience in building similar and more complex apparatus, is assurance of receiving sugar machinery based on the soundest principles of engineering and manufacturing practice.

Only a few types of sugar apparatus are shown. Full information pertaining to any of the items listed on the fourth page preceding will be furnished on request.

"BUFLOVAK" ROTARY FILTER

Used for decolorizing and removing suspended matter and impurities from syrup before filtering in the vertical filter. Operates continuously, the syrup passing through the filter cloth by gravity, and the remaining syrup, scum and residue being removed in order by a vacuum suction nozzle on one side and another at the top, and a steam jet on the opposite side.

"BUFLOVAK" ROTARY FILTER

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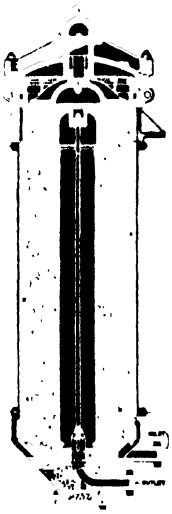
SUGAR APPARATUS: Continued

"BUFLOVAK" VERTICAL FILTER

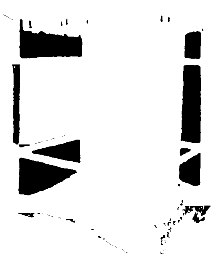


VERTICAL FILTER

Used for filtering with bone black and other filtering mediums. The filtering medium is inserted between two concentric screens contained in the filter. The inner screen and the top of the filtering medium is covered with filter cloth. The filtration takes place through the outer screen, through the filtering medium, into the inner screen and out.

Provision is made against floating of the material and the formation of short circuiting channels. When the filtration is completed the filter is drained, and the impurities are removed by blowing steam through the filtering medium in the opposite direction, this cycle being repeated until necessary to renew the filtering materials.

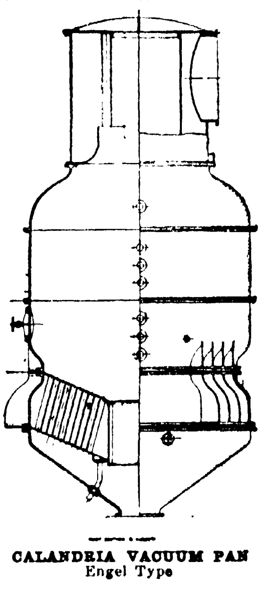
BAG FILTER



REMOVABLE HEAD FOR RECTANGULAR BAG FILTER

Constructed in rectangular and cylindrical types, and arranged to permit removal and replacement of heads and bags with the least amount of interruption to operation. Provision is also made so as to prevent a falling bag from closing entirely the discharge opening.

"BUFLOVAK" CALANDRIA VACUUM PANS



CALANDRIA VACUUM PAN
Engel Type

These are built in several types including the Engel calandria, flat calandria, and coil types. The Engel type calandria pan is designed for evaporating at low temperature and low steam pressure, liquids of various densities, including highly concentrated juices. The heating element is placed at a low point in the pan in order to control the size of the crystal, and finish the crystallization in the same apparatus, instead of distributing the nucleus into several pans to obtain the required size of the crystals. For supersaturated and highly concentrated liquids a propeller is provided at the bottom of the pan.

Special calandria and coil type pans are built to order.

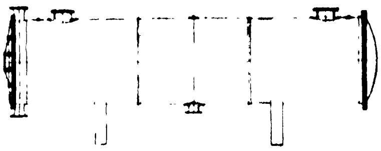
ROTARY DRYER, ENGEL TYPE

Designed for drying sugar and a variety of other materials that do not require a vacuum. A special feature of this dryer is our patented disseminating screen which is concentric with the drum. The material falling on this screen, as the shell revolves, becomes disseminated and allows for the free action of the drying air. The screen also breaks the fall of crystals, thereby reducing the breakage of crystals into small particles and the consequent formation of dust.

ROTARY DRYER, ENGEL TYPE

"BUFLOVAK" JUICE HEATER

This heater is of the floating head type, allowing for expansion and contraction in the tubes, and eliminating stuffing boxes. One end of the heater is provided with a rigid head and the opposite end with a number of sliding heads to which are connected the nests of tubes. The juice enters at the bottom of the rigid head and after passing through the heater by means of the tubes, passes out at the top of the rigid head. The efficiency of this heater lies in the high velocity of the juices through the tubes, low cost of maintenance, and the fact that it is easily cleaned.



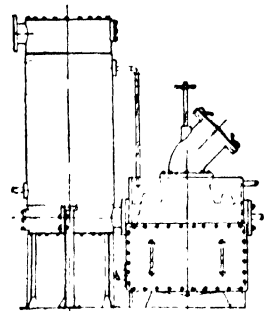
"BUFLOVAK" JUICE HEATER

"BUFLOVAK" SULPHUR FURNACE AND COOLER

This sulphur furnace is of the continuous type and can be charged without interfering with the operation of the stove.

The sulphur drops from a special hopper to the combustion tray provided with slotted openings, which serve to spread the air evenly over the whole surface, thus obtaining a uniform combustion. The condensed sulphur is removed without any trouble by means of hand-holes in the cooler.

These furnaces and coolers are furnished either single or in batteries to take care of any capacity desired.



"BUFLOVAK" SULPHUR FURNACE AND COOLER

SPECIAL SUGAR APPARATUS

We are prepared to build apparatus according to our standard or special designs, or in accordance with plans and specifications submitted by customers.

BUFFALO METER CO.

ESTABLISHED 1892

2887 Main Street, BUFFALO, N. Y.

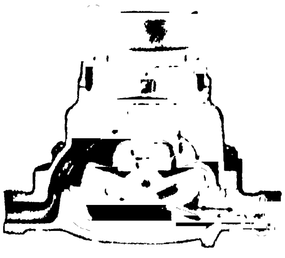
PRODUCTS

Niagara and American Water Meters
Niagara Oil Meters for Oils and Gasoline
Niagara Hot Water Meters

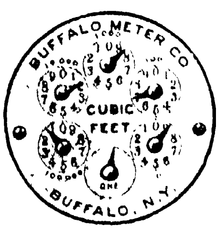
NIAGARA AND AMERICAN WATER METERS

Over 400,000 sold

Niagara and American Meters are of the disc type. The Niagara Meter has a galvanized cast iron outside casing; the American Meter has a bronze main casing with either a bronze base or a galvanized cast iron base. The works in the three different casings are the same and interchangeable. Upon opening the meter at the bolted flange, each intermediate gear may be immediately removed from its bearing, the measuring chamber lifted from its seat, the strainer slipped out, or the register tried by turning the stuffing box gear. All submerged working bearings are protected against sand and sediment. The hard rubber measuring disc is reinforced with a metal plate. Purchaser has option of round reading or straight reading register indicating cubic feet, U. S. gals., imp. gals., or litres.



NIAGARA AND AMERICAN WATER METER PATENTED



ROUND READING REGISTER

STRAIGHT READING REGISTER

GROSS PRICE LIST WATER METERS, JAN. 1, 1920

Size of meter inches	Greatest proper capacity U S gals per minute	Niagara meter only galv iron outside case	American meter only bronze main case and galv iron base	American meter only all bronze outside case	Brass couplings per pair extra	Approx weight meter and couplings boxed lbs
⅝ x ½	20	$16 00	$18 00	$20 00	$1 00†	14
⅝ x ¾	20	16 00	18 00	20 00	1 50†	14
¾	34	24 00	27 00	30 00	1 50†	20
1	53	35 20	39 60	44 00	2 20†	30
1¼	75	48 00	54 00	60 00	3 00	40
1½	100	64 00	72 00	80 00*	4 00	60
2	160	96 00	108 00	120 00*	6 00	100
2½	240	140 00	157 50	175 00	8 75	150
3	315	192 00	216 00	240 00	Flanges no charge	200

* 1½″ and 2″ All-bronze case meters may be furnished with internal standard pipe threads when specially ordered

† In these sizes quarter bent couplings may be furnished at the following prices per pair ½″, $1 50, ¾″, $2 00, 1″, $3 00.

NIAGARA OIL METER

For Oil and Gasoline.

Niagara Oil Meters are used to measure and compare the quantity of oil and gasoline delivered in tank cars or otherwise with the amount invoiced; they are used to show the consumption and regulate the flow of oil to burners under boilers, furnaces and ovens; they measure gasoline pumped or forced from gasoline storage and retailing systems. They will operate on pressures of a pound per square inch or higher, and on oil of any temperature, and thus are adapted for use under almost all conditions. The size of meter to use is determined by the rate of flow to be measured. For meters with large vertical dial add $20.00 to list.

NIAGARA OIL METER PATENTED

GROSS PRICE LIST OIL METERS, JAN. 1, 1920

Size of meter	Capacity for continuous rates of flow per hour, U S gals	Size inches, and kind of pipe connections	List prices
A	6 to 300	½ Unions	$20 00
B	10 to 500	½ or ¾ Unions	20 00
C	30 to 1000	¾ or 1 Unions	30 00
DV	60 to 2000	1 or 1¼ Unions	44 00
EV	90 to 3000	1¼ or 1½ Unions	60 00
FV	120 to 4000	1½ Unions	80 00
F	175 to 6000	1½ or 2 Unions	120 00
G	250 to 9000	2 or 2½ Unions	160 00
G	250 to 9000	3 Flanges	200 00

NIAGARA HOT WATER METER

The Niagara Hot Water Meter is similar in design to the Niagara Cold Water Meter but has works of special construction to run in water of any temperature up to 250° Fahrenheit. The register is of the all-metal straight reading type and indicates U. S. gallons, imperial gallons or litres. For meters with large vertical dial add $20.00 to list.

GROSS PRICE LIST HOT WATER METERS, JAN. 1, 1920

Size of meter	Capacity According to h p of boiler	†Size inches and kind of pipe connections	List prices
B	8 to 20 H P.	½ or ¾ Unions	$20 00
C	10 to 40 "	¾ or 1 Unions	30 00
D	25 to 90 "	1 or 1¼ Unions	44 00
EV	40 to 150 "	1¼ or 1½ Unions	60 00
E	50 to 200 "	1¼ or 1½ Unions	80 00
F	80 to 325 "	1½ Unions	120 00
G	150 to 600 "	1½ or 2 Unions	160 00
G	150 to 600 "	2 or 2½ Unions	200 00
Battery 2 3″G	300 to 1200 "	3 Flanges	450 00

† The size of meter required is not determined by the size of pipe on which it is to be set, but by the flow to be measured. To facilitate setting on different sizes of pipes each meter may be furnished with either of the two sizes of connections and openings listed.

H. W. CALDWELL & SON COMPANY

LINK-BELT COMPANY, OWNER

Elevating, Conveying and Power Transmitting Machinery

Main Office and Works
17TH STREET AND WESTERN AVENUE, CHICAGO, ILL.
EASTERN SALES AND ENGINEERING OFFICE New York 50 Church St
SOUTHERN SALES OFFICE 709 Main Street Dallas Texas

PRODUCTS AND SERVICES:

Elevating, Conveying and Power Transmitting Machinery —including Bearings, Helicoid Screw Conveyors, Apron, Belt, Drag and Pan Conveyors, Malleable and Steel Chain, Bucket Elevators, Gears, Pulleys, Friction clutches, Ice Handling Machinery, Rope drives and Sheaves, Sprocket wheels, Screens.

Special Machinery constructed according to customer's design.

Engineers, Founders and Machinists.

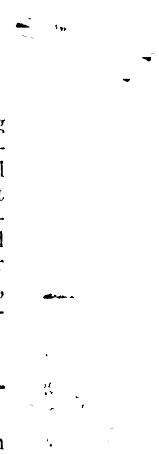
PAN CONVEYER

ELEVATING MACHINERY:

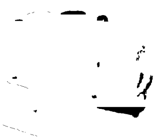
Elevators of all kinds for handling fine and coarse material used in chemical manufacturing and allied industrial plants. Elevators—with buckets on belt or chain. Box, barrel and package elevators. Elevators for coal, coke, sand and stone. Elevator casings of steel or cast iron. Elevator buckets of steel, malleable iron, copper, aluminum. Elevator boots of steel or cast iron.

POWER TRANSMITTING MACHINERY:

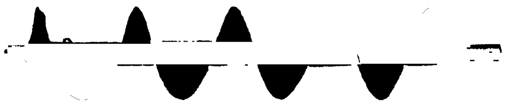
Babbitted bearings of all types, plain oiling, self-oiling, rigid, ball and socket. Shafting collars, pulleys, friction clutches, friction clutch pulleys and cut-off couplings. Flywheels up to twenty feet diameter, complete rope drives, sprockets with chilled rims.



STEEL ELEVATOR CASING



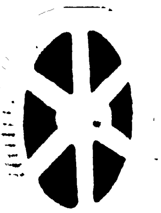
BEARINGS



"HELICOID" CONVEYOR

CONVEYORS:

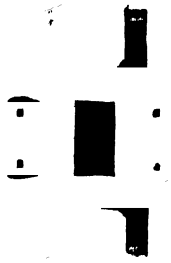
Sole manufacturers of "Helicoid" Screw Conveyor, the only conveyor having flight made of one continuous strip of metal. No rivets or laps; mounted on pipe or solid shaft. Sizes 3 to 16 inches. Made of steel, copper, aluminum, brass and cast iron. We also make belt conveyors, apron conveyors, drag conveyors, pan conveyors of steel and cast iron. Troughs for screw conveyors made of steel, copper or cast iron.



MACHINE MOLDED GEAR

GEARS:

This company has the most complete line of preparations and patterns in the United States for making machine and pattern molded gears. Made of cast iron, semi-steel, cast steel, brass or bronze. We also furnish gears with machine cut teeth. Also mortise wheels and worm drives.



MALLEABLE AND STEEL CHAIN

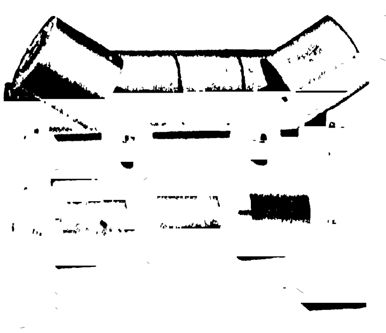
CHAINS:

Standard malleable link chain belting, combination malleable and steel chain, malleable roller chain, steel chain with or without rollers and bushings.

CATALOG:

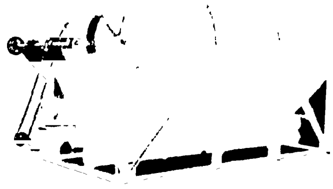
Catalog No. 45 contains over 800 pages of illustrations, lists and information of value. A copy will be gladly sent prepaid upon request.

STEEL BUCKETS



HEAVY BELT CONVEYOR CARRIERS

STEEL PAN CONVEYOR



SCREEN WITH STEEL HOUSING

W. E. CALDWELL COMPANY

INCORPORATED

Manufacturers of Wood and Steel Tanks, Towers, Agitators and Power Transmission Machinery

2232 BROOK STREET, LOUISVILLE, KY.

THE TANK WITH A REPUTATION
Caldwell
TANKS AND AGITATORS

PRODUCTS: Wood and Steel Tanks, Round, Rectangular or any shape or size with or without lead or other lining, for water, acids or any liquid; Tank Agitators and complete mixing or processing tanks: Tank Towers of Steel and Wood; Friction Clutches, Pulleys, Gearing and General Power Transmission Machinery.

INDUSTRIAL TANKS:

We have always made a specialty of industrial tanks (chemical, paper mill, dyeing, etc.) and our plant is peculiarly adapted for manufacturing agitators and tanks with mechanical attachments as we have our own foundry, machine, structural and plate steel shops in addition to our wood tank shop.

TANK WOODS:

We build tanks of cypress, fir, yellow pine, white pine, white cedar and yellow poplar and from thirty years' experience we have deduced the following facts:

ROUND WOOD TANK

Cypress is without question the best tank wood for water and most acids including sulphuric, muriatic, and acetic. It resists the charring action of sulphuric acid better than any other wood and can be used with hot or cold solutions up to about 20° Be. Stronger solutions require a lead lining. It is also used for brine, tar, tar oil, fuel oil and a number of other liquids.

Fir is second to cypress in its general qualities and for use with water but it has not been used to any great extent for holding chemicals though it has so far shown many of the qualities of cypress.

Yellow pine is best suited for nitric acid as it resists oxidation better than any other tank wood. It will also hold satisfactorily weak solutions of other acids.

White pine is probably best suited for brine tanks and as a cheaper substitute for cypress.

White cedar is a cheaper tank wood and is used mostly for water.

Yellow poplar is the closest grained tank wood and is used to hold the alcohols and other penetrating liquids.

ROUND WOOD TANKS:

We regularly furnish round wood tanks in accordance with the following specifications, but we can make them to meet any special requirements.

SPECIFICATIONS:

Lumber—Thoroughly dry, without loose or unsound knots, splits, shake, peck, worm holes or other defects. All heart throughout when so specified, or otherwise all heart on inside, no sap except sound sap on outside only and then not to exceed one-half the thickness.

Thickness for Water—2 inches for 10,000 gallons and smaller, 2½ inches up to 20,000 gallons, 3 inches for larger sizes, and 4, 6, 8 or 10 inches for special purposes. The finished thicknesses are 1¾, 2¼, 2¾, 3½, 5½ and 7½ inches respectively.

Standard Inside Diameters

Diam.		Gals. 1 ft. deep	Diam.		Gals. 1 ft. deep	Diam.		Gals. 1 ft. deep
ft	ins.		ft	ins.		ft	ins.	
3	0	52 8	7	6	330 4	16	0	1503 9
3	6	71 9	8	0	376 0	18	0	1903 3
4	0	94 0	8	6	424 4	20	0	2349 9
4	6	118 9	9	0	475 8	22	0	2843 3
5	0	146 9	10	0	587 4	24	0	3383 8
6	0	211 4	12	0	845 9	26	0	3971 3
6	6	248 1	12	6	917 8	28	0	4605 8
7	0	287 8	14	0	1151 3	30	0	5287 3

Standard Inside Depths

Ft.	Ins.	Ft	Ins.	Ft.	Ins	Ft.	Ins.	Ft.	Ins
1	5	3	5	6	5	11	5	19	4
2	0	4	0	7	5	13	5	21	4
2	5	4	5	8	5	15	4	23	4
3	0	5	5	9	5	17	4	25	4

Finish—Staves dressed both sides. Edges machine jointed to proper bevel. Bottom dressed on top side only. Machine jointed straight and square and well dowelled. Staves crozed to suit the circle of the bottom and taper of the tank and to make a driving fit on the bottom. Bottom chamfered on under side and left slightly thicker to allow for shrinking, if any, before erection.

Hoops—Round hoops of wrought iron (not steel) with malleable iron draw lugs, with sizes and spacing to give a safety factor of 4 to 1 for each hoop, or heavier for special purposes when so specified, also brass, copper, galvanized, lead covered or other kind of hoops when specified.

RECTANGULAR WOOD TANKS:

We have been building this style of tank for a great many years and were the first to perfect and adopt a standard method of construction which we have reason to believe, from long experience, is about the best possible method.

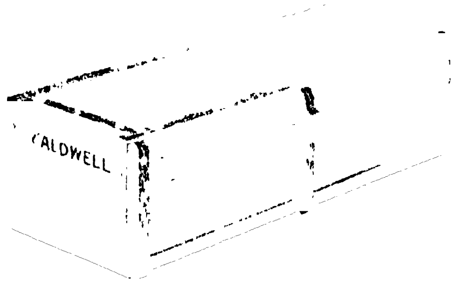
The bottom is crozed (or grooved) to receive the sides and ends and the sides are crozed to receive the ends. This gives wedged joints which are water-tight even without the pull of the rods.

Continued on Next Page

We build these tanks in any size wanted with or without partitions, false bottoms, etc., or with lead or other lining when required. The rodding is thorough and the sizes and spacing are carefully figured out by our engineering department to give a full factor of safety of 4 to 1 with the liquid used, so that no bulging is possible. All rods except the horizontal outside end rods pass through the wood.

Where the length exceeds certain proportions the sides are braced against bulging. The simplest and best method is by rods through the center of the tank and is used where their presence is not an objection, otherwise the sides are trussed on the outside by iron rods as shown in the illustration, or by a wood truss if the iron is objectionable.

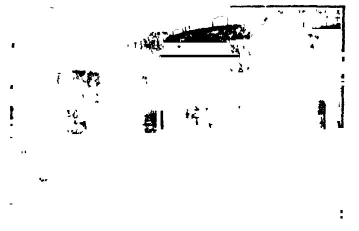
We can furnish brass, copper, bronze, galvanized, lead covered or Duriron rods. When required we countersink the nuts on top and cover with a hard-wood coping.



RECTANGULAR WOOD TANK

STEEL TANKS:

We make steel tanks in round, rectangular or any shape or size and carry a good stock of steel for the usual sizes and thicknesses. For round tanks the standard diameters and depths are in even feet and the standard thicknesses are, for 10 ft. diameter and under ⅛ in., 16 ft. diameter and under 3/16 in., 24 ft. and under ¼ in. and above 24 ft. thicknesses to suit with ¼ in. minimum.



STEEL TANKS SET UP IN SHOP

Rectangular steel tanks are made of slightly heavier material than for round tanks of the same capacity. They are thoroughly braced against bulging by angles and ties.

We can furnish steel tanks set up in the smaller sizes or knocked down, all punched, fitted and bent to shape with the necessary rivets.

All steel tanks are set up in the shop to insure correct fit. See illustration.

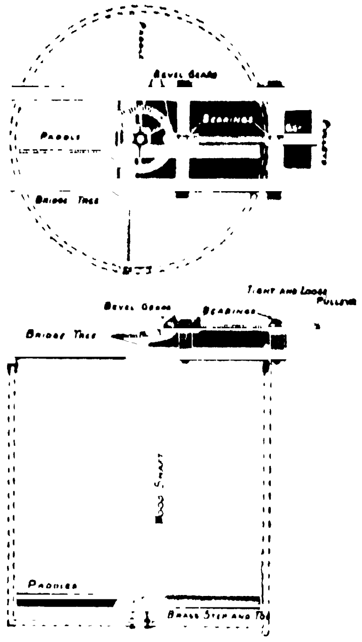
TANK AGITATORS:

We are the originators of this style of agitators and have been building them for a great many years.

All parts including those of iron, steel and brass are made in our own shops and are designed especially for this purpose insuring proper strength and fit.

Our agitators are thoroughly and substantially made and are designed for mixing, stirring and holding in suspension all sorts of solutions and mixtures including dense and plastic materials.

The standard sizes have dimensions of the machinery and other parts proportioned to the diameters and depths of the tanks in which they are used, assuring the proper strength for all ordinary purposes. For heavy service we make special designs to suit.



TANK AGITATORS

Pulleys, Sprocket, Gears or Friction Clutch can be used

We make these agitators to fit wood or steel tanks.

Our standard design consists of steel shafts and winged stirrer arms, heavy cast iron gears, step and toe bearings, anchors and bolts with long leaf yellow pine millwright timbers across the top of the tank; all framed and finished with all holes bored and bearings set all ready to attach to the tank which any ordinary workman can do even without the blue prints we furnish.

Where the substance to be stirred will injure the ironwork or be injured by it, we make the vertical shaft and winged stirrer arms of wood and the step and toe bearings, bolts, nuts and washers of brass, bronze, Duriron or other acid resisting metal.

The proper speed in most instances is 500 to 1000 ft. per minute at ends of stirring arms.

We also make complete mixing and processing tanks

AMONG OUR CUSTOMERS ARE:

Edison Chemical Works, Silver Lake, N. J.
Maas & Waldstein Co., Newark, N. J.
General Chemical Co., New York City
Aetna Explosives Co., New York City
E. I. Du Pont De Nemours and Co., New York City
Standard Aniline Products Co., New York City
Virginia-Carolina Chemical Co., Richmond, Va.
Rollin Chemical Co., Charleston, W. Va.
Warner-Klipstein Chemical Co., Charleston, W. Va.
American Agricultural Chemical Co., New York City
Roessler & Hasslacher Chemical Co., St. Albans, W. Va.
Ammo-Phos Corpn., New York City.

THE CANNON-SWENSON COMPANY

Consulting, Designing and Contracting Engineers

53 W. Jackson Boulevard
CHICAGO, ILLINOIS

SERVICE

Our service consists of the following:

CONSULTATION

Reports on proposed new enterprises as well as the remodeling of old ones.

Recommendations as to advisable changes in inefficient factories or plants.

Appraisals and confidential reports for banks or other fiscal agents.

Cooperation assisting clients in organizing operating force.

CONSTRUCTION

We are equipped to design, engineer and supervise construction of complete industrial factories or plants.

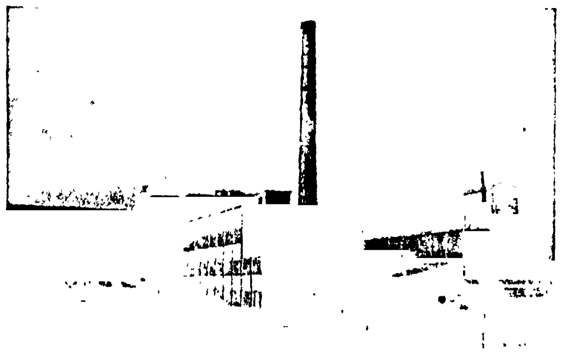
We are also prepared to contract for such factories or plants on percentage or lump sum basis.

The Cannon-Swenson Company offers a complete organization for the construction of Chemical plants in particular.

This service includes designing, purchasing and inspection of all materials, construction, installation of all machinery and equipment, and operation.

STAFF

The staff includes seasoned engineering specialists of wide field reputation for work **well done.** Their engineering counsel and judgment is backed by years of practical experience.



KOREAN BEET SUGAR COMPANY, PING-YANG, KOREA

Successful operation, 1920, for Japan Sugar Co.

LIME KILN AND HOUSE

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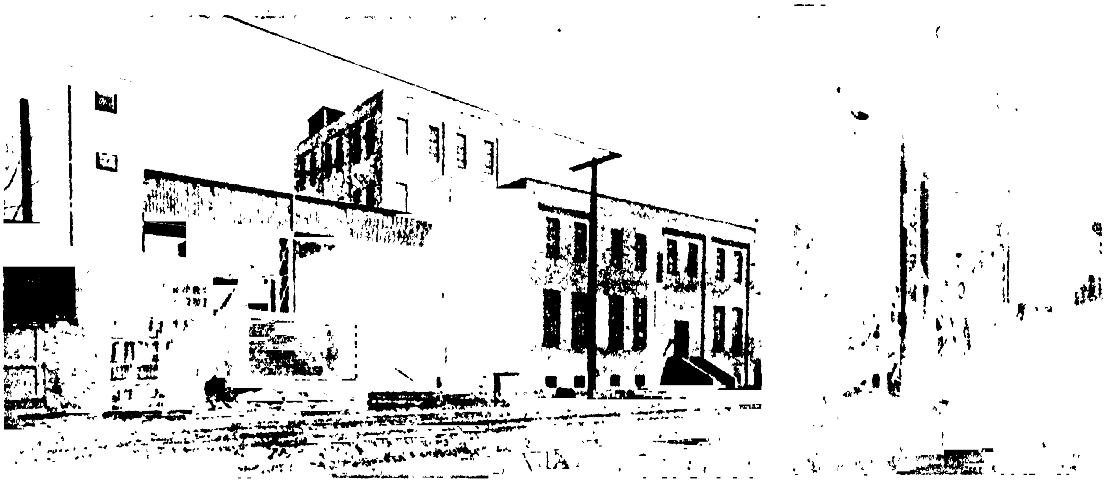


Factory Buildings

Tanks and Continuous Filter

FACTORY FOR MANUFACTURE OF TRI SODIUM PHOSPHATE AND GLAUBER SALT

EXPERIENCE

Our experience covers the industrial engineering field thoroughly and we can particularly refer to extensive experience in the following.

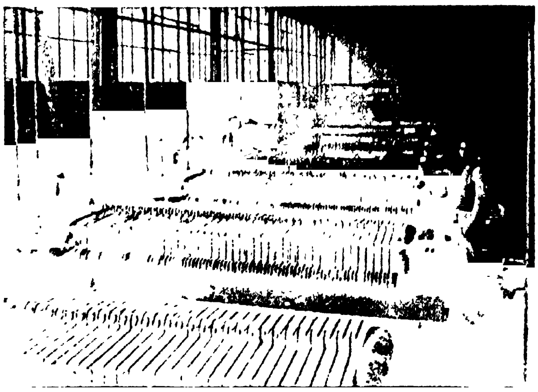
Complete factories and plants for manufacture of:

- Beet Sugar and By-Products
- Cane Sugar
- Maltose Sugar
- Potash
- Caustic Soda
- Calcium Chloride
- Salt
- Chemical Wood Pulp
- Refineries

Complete wood distillation plants and by products:

- Wood Alcohol
- Acetate of Lime
- Acetone
- Acetic Acid
- Formaldehyde
- Turpentine
- Rosin Oils
- Tanning Extracts

If you are considering the erection of new plants, plant extensions or improvements—or if you are interested in gaining increased plant efficiency and production—it is probable our wide experience will prove of value and service.



FILTER PRESS STATION

CONTROL LEVEL, DIFFUSION BATTERY

CARRIER ENGINEERING CORPORATION

Specialists in Air Conditioning and Drying

750 FRELINGHUYSEN AVENUE, NEWARK, N. J.

Trade-Mark

BRANCH OFFICES
New York 39 Cortlandt Street
Boston 176 Federal Street
Buffalo Prudential Building
Philadelphia. Land Title Building
Chicago Transportation Building

SERVICES AND PRODUCTS

Consultation, Designs, Construction, Equipment and Installation, complete or in part, of plants for the purpose of Humidifying, Dehumidifying, Cooling, Air Washing, Automatic Temperature and Humidity Regulation, and Drying. Designs and Complete Installation of Process and Power Piping Systems.

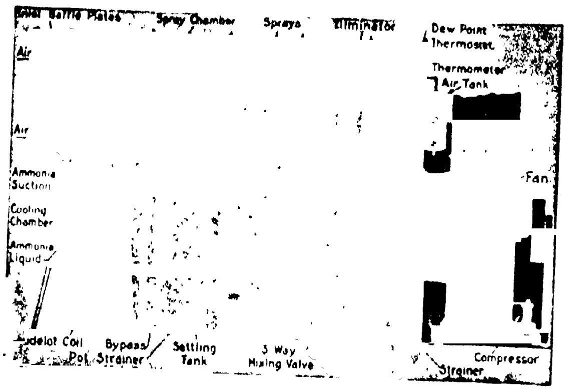
Carrier Apparatus, during seventeen years of constant research and development, by the pioneer engineers in air conditioning, has won its place in more than one hundred distinctly different American industries, comprising more than a thousand separate installations. Wherever weather, or atmospheric condition, affects the efficiency of the manufacturing process, or the production capacity of labor, Carrier Apparatus will manufacture weather to order, providing an automatically and positively controlled temperature, humidity, purity, and air distribution. In any one of its thousands of applications Carrier Apparatus is guaranteed to produce the results for which it is installed.

An engineering staff of trained experts is at the disposal of our clients. A Department of Research and Development, with an adequate personnel and complete facilities, is ready to investigate new applications in any industry.

AIR CONDITIONING

Air Conditioning involves four principal factors: the control of temperature, humidity, purity, and the effective distribution of air. Experience, in hundreds of instances, has shown that the effects of air, upon the process, or upon the worker, depend upon the humidity rather than the temperature. Normal atmospheric air varies from a moisture content of a fraction of a grain per cu. ft., in the winter, to as much as ten grains per cu. ft., in the summer. Winter air contains so little moisture that water-vapor must be added to produce a condition conducive to health, and suitable for the promotion of process efficiency, wherever the product is affected by moisture in the air. The addition of moisture to the air is usually termed "humidification." Humidifiers produce their effect by spraying warm water into the air passing through the machine. The temperature of the water determines the degree of saturation of the air. Automatic control instruments are provided, which are actuated by the saturation temperature of the air leaving the humidifier, and which control the temperature of the spray water. This control is positive and entirely automatic.

Summer air oftentimes contains too much water-vapor for comfort, or for the successful operation of manufacturing processes. During the summer the temperature, also, may be too high to permit efficient operation. The process of removing part of the moisture in the air, and lowering its temperature when desirable, is termed "dehumidification." Dehumidifiers produce their cooling and drying effect by spraying cold water into the air as it passes through the machine. This cold water may be obtained from wells or other natural sources, or it may be cooled by mechanical refrigeration. The control operates as in the humidifier, except that the control valve regulates a 3-way cold water mixing valve, instead of a steam heater valve.



SECTION OF TYPICAL CARRIER DEHUMIDIFIER

When the air leaves either the humidifier or the dehumidifier it is saturated to a definite, controlled percentage of Relative Humidity, and, in winter, passes over steam heaters which bring it to a controlled temperature before admitting it to the kiln or building, as the case may be. The temperature control instrument is located in the area being conditioned. It is a duplicate of the instrument which controls the humidity. In summer, where no mechanical refrigeration is necessary, the heaters are, of course, cut off, and the air blown from the humidifier directly into the building. This air will enter the building from 10° to 25° cooler than the outside air, due to the cooling effect of evaporation in the humidifier. This cooling effect is obtained without additional operating expense and without changing the adjustment of the apparatus.

Air Conditioning has proven itself a dependable ally in many of the most important American industries. For the control of moisture regain, for effecting fractional crystallization, for cooling, for heating and ventilating and conditioning, for drying, either as applied to the unit or the progressive type of dryer, for humidifying, and for dehumidifying, Carrier Apparatus can be designed to meet any requirement and to reduce the technical control of atmospheric conditions to a practical and efficient mechanical basis, as simple and positive as the control of heat with the pyrometer.

Our bulletins are a liberal education in Air Conditioning. They are gratis, upon request.

Address the New York Office.

FRED S. CARVER

Mechanical Engineer and Manufacturer of Hydraulic Equipment for Special Uses

8 WEST 40TH STREET, NEW YORK, N. Y.

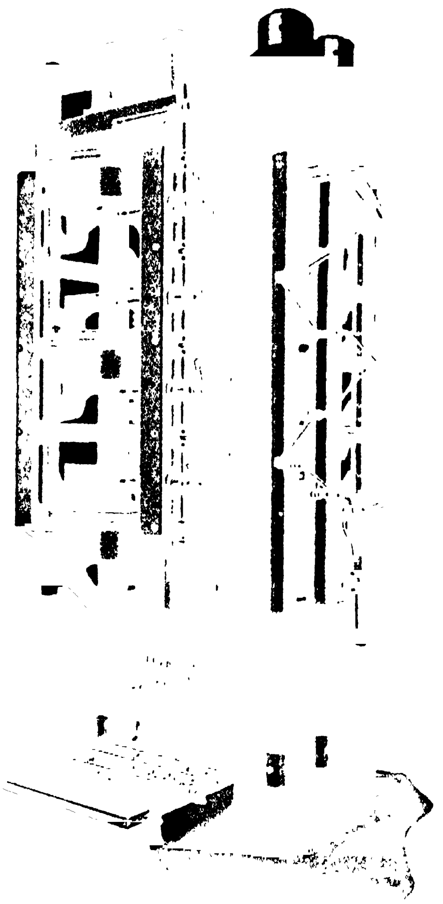
PRODUCTS

Hydraulic Presses for extraction of oils and for certain other purposes; also Cocoa Butter Presses and the Carver Accumulator System adapted especially to operation of oil presses, hydraulic valves, fittings, etc.

We lay out and furnish complete hydraulic equipments for this work.

CARVER OIL PRESS

This is a type of oil press which, due to certain features of its design, will extract higher percentages of oil from a given material than any of the presses at present used.



CARVER OIL PRESS

USES

These presses are made in a number of sizes and models adapted to handle most of the oil bearing seeds and materials requiring extraction by hydraulic pressure. Their introduction for use on materials on which the value of the oil is high and the pressed cake is low is exceedingly profitable. Gains of 1% to 10% in oil extracted can be had under various conditions and often this means additional profits at first hardly believed possible.

This type of press, which we have been the first to build in this country, was developed first for pressing cocoa butter, which is most exacting in its requirements. The presses are equally well adapted to pressing linseed, copra, cottonseed, peanuts, soya beans, corn oil and various of the other oil bearing materials, seeds, nuts, etc. Certain modifications as to details are required for the different materials but on all the very highest yield of oil will be obtained and whatever additional profit this means.

PRINCIPLE

The material to be pressed is confined in a series of cylindrical pot units and a higher pressure is exerted on it than in any of the presses at present being used in the oil industry. Thus the cakes are confined at the edges and receive this high pressure uniformly, there being no more oil left in edge of cake than in any other part. Filter pads or strainers are flat and on top and bottom of cake only, so are not stretched and torn by spreading of cakes as in other presses. Thus all the material is uniformly pressed to the greatest practical extent, giving up a maximum yield of oil.

GENERAL DESCRIPTION

We make these machines in two sizes, best adapted for general quantity production. These are varied as to certain details of equipment for different materials. They are thoroughly standardized and fully developed machines, most of the new developments being covered by patents.

We can furnish presses with automatic filling equipment for materials that can be pumped and can equip them to eject the cakes automatically for large quantity production in any material.

Filter pad expense is a relatively small item for these presses, when pads are used, and for a number of materials no pads will be required and for others metallic strainers can be used.

We have developed a special type of accumulator system, for operation of these or presses of any type, which is a radical improvement over the weighted types that have been generally used, reducing trouble and increasing production.

INQUIRIES

It is our belief that the use of these presses in most lines of oil pressing will produce very large increased earnings.

In addition to the above described line of machines we have developed others along somewhat different lines for certain specific requirements in work of this character.

We shall be glad indeed to receive inquiries as to any given material, with as complete information as possible as to its nature, present method of handling, if any (with pressure used on it), oil content, etc. On receiving such inquiries we shall be glad to advise as to what might be expected from our equipment and to offer a detailed proposition whenever its use would be to our mutual advantage.

We will also welcome opportunities to quote on our Hydraulic Accumulator System to operate any oil mill.

CELITE PRODUCTS COMPANY

11 Broadway
NEW YORK, N. Y.
Philadelphia Liberty Building
Cleveland Guardian Building

Monadnock Building
CHICAGO, ILL.
Detroit Book Building
St Louis Railway Exchange Building
New Orleans Whitney Central Bank Building

Van Nuys Building
LOS ANGELES, CALIF.
Denver, 16th and Champa Streets
San Francisco, Monadnock Building

PRODUCTS

Filter-Cel for Filtration
Sil-O-Cel for Heat Insulation

SIL-O-CEL

General Description and Use—Sil-O-Cel, a light weight highly siliceous material produced in brick, blocks, powder and cement form is used to prevent heat penetration. Its insulating value is from ten to twelve times that of ordinary fire brick and is known to withstand temperatures that completely destroy other forms of insulation.

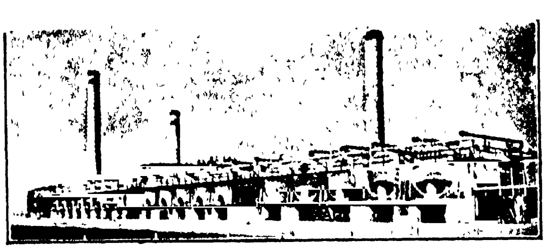
Advantages of Insulation

- Prevents heat loss
- Increases the output of the equipment
- Saves fuel
- Insures better working conditions
- More accurate temperature control

Boiler and Furnace Insulation—Sil-O-Cel Insulating Brick are laid up between the fire brick and red brick courses in the setting usually to a thickness of 4½ inches. Sil-O-Cel insulation will effectively prevent the loss of heat through the setting and provide a cool exterior surface.

BOILER SIDE WALL INSULATED WITH SIL-O-CEL INSULATING BRICK

Insulation of Stills—By insulating stills and still settings, higher efficiency, increased output and more accurate, even control of temperature are obtained.



BATTERY OF STILLS INSULATED WITH SIL-O-CEL BRICK AND INSULATING CEMENTS

SIL-O-CEL INSULATING PRODUCTS

Sil-O-Cel Insulating Brick—Made in standard fire brick sizes and are used as an insulating backing for the fire brick in all types of high temperature equipment.

Sil-O-Cel Blocks—Made in sizes 6 x 36 and 6 x 18 inches, 1, 1½, 2 and 3 inches thick. They are a bonded form of Sil-O-Cel suitable where a high temperature insulation is required in large sections.

Sil-O-Cel Insulating Powder—This form has the same insulating qualities as Sil-O-Cel Brick but is used where brick is not adaptable for insulating, such as—hot blast stoves, gas generating equipment, doors of ovens and boilers. It is also used for fire proofing and sound deadening in building construction.

Sil-O-Cel C-3—A semi-refractory material of high insulating value, prepared in granular form. When suitably bonded by the addition of 20 per cent by volume of Portland Cement (process patented) and moistened slightly, this material is ideal for insulating furnace bases, doors, etc. The mixture should be rammed into place.

Sil-O-Cel C-22 Brick—A semi-refractory type of Sil-O-Cel Brick made in standard fire brick sizes. Being free from shrinkage at high temperatures, will not spall with sudden temperature changes. They are recommended as an intermediate insulating course for the protection of the insulation under extreme temperature conditions.

Sil-O-Cel Insulating Cements—Adaptable for the insulation of irregular surfaces or in places where other Sil-O-Cel products are not adapted. They are prepared in three coats and applied as follows:

1. Sil-O-Cel Sticking Cement (First Coat) is used to produce a surface to which the second or insulating coat will adhere.
2. 85% Sil-O-Cel Insulating Cement (Second Coat) is the insulating coat, having unusually high insulating value and durability under heat.
3. Sil-O-Cel Hard Finish Cement (Third Coat) is used to give the work a smooth, hard, durable finish.

These cements are used to insulate boiler drums, evaporators, vulcanizers, storage tanks, flues, breechings and other heated surfaces.

Application—

Annealing Furnaces
Annealing Pits
Bake Ovens
Boiler Settings
Bustle Pipes
Coke Ovens
Core Ovens
Dryers
Dust Catchers
Electric Furnaces
Enameling Ovens
Furnace Doors
Gas Generators
Gas Producers
Heat Treating Equipment
High Temperature Flues
Hot Blast Mains
Hot Blast Stoves
Hot Metal Cars
Japanning Ovens
Kilns
Malleable Furnaces
Marine Boilers
Metal Mixers
Oil Stills
Pipe Covering
Regenerators
Soaking Pits
Tanks and Vats
Waste Heat Boilers

CELITE HIGH TEMPERATURE CEMENTS

These are mixtures of ceramic materials scientifically compounded for laying, facing and patching fire brick work in boiler settings, furnaces, etc. They set up under the action of heat making a bond structurally as strong as the fire brick with absolutely no shrinking or swelling. Celite High Temperature Cements bond the refractory together, making a solid monolithic structure.

CELCOTE

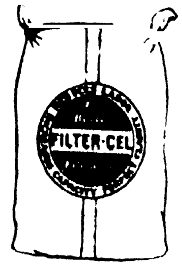
An elastic, adhesive cement used to prevent air infiltration and also as a waterproofing coat for Sil-O-Cel insulation.

ENGINEERING SERVICE

Detailed information on any specific insulating problem will be furnished by our engineering department. Bulletins containing engineering data on any of the above types of equipment will be sent on request.

Continued on Next Page

FILTER-CEL



Filter-Cel is a porous siliceous filtering material prepared in powdered form. It is inert and insoluble in solutions of mineral or organic acids, salts and organic solvents and can be used in all types of filters. When lightly packed, Filter-Cel weighs only eight pounds per cubic foot. Due to its lightness of weight and the large surface area of its particles, Filter-Cel can be readily mixed to a uniform suspension in liquids. It can be used to advantage in the filtration of any character of product resulting in greater clarity and increased capacity with a reduction in labor.

Method of Using--Filter-Cel is thoroughly mixed with the turbid liquid prior to filtration. The quantities used ordinarily vary from one-tenth to one-half per cent. on the weight of the liquid according to the nature and quantity of suspended matter present. The suspension is then pumped through the filter, the Filter-Cel and the suspended solids being completely retained on the filter cloth or other retaining medium. As the filtration continues, additional Filter-Cel is automatically deposited along with the suspended matter providing a continual renewal of the filtering surface, the resultant porous filter cake itself acting as a most effective filter.

It is often advisable to use a larger percentage of Filter-Cel in the first liquid entering the filter to protect the cloths from the slimy precipitate and to eliminate the danger of the liquid running cloudy at high pressures.

Action—As filtration is a process of straining, the finer the strainer the more perfect the filtration.

The action of Filter-Cel in general is a purely physical one, having a microscopic porosity it affords the best means of getting more complete retention of suspended matter than is possible with any other method of filtration, and at the same time provides channels which permit a more rapid flow of the liquid.

Filter-Cel is especially valuable in pressure filters of all types.

Improving Filtration—Practically all difficulties in filtration processes are due to the cake or solids forming an impervious coating on the filter cloth.

This is particularly the case when suspensions of a gelatinous and colloidal nature are filtered. The continuous addition of Filter-Cel neutralizes this clogging action by providing fresh filtering surfaces and a porosity of filter cake that allows filtration to proceed without the rapid retardation usually encountered.

Advantages—The most important result to be derived from the use of Filter-Cel is the perfect quality of the filtration.

Further advantages are the increase in the capacity of the filter through obtaining a greater flow of liquid per unit of filtering area, or through lengthening the filtration period or cycle or both. This usually also results in a saving of labor. Filter-Cel cakes are easier to remove, and in many cases the filter cloths can be reused without washing, thus resulting in additional saving of time and labor. It is not only possible but is a distinct advantage to use a lighter grade of filter cloths when using Filter-Cel.

Due to the porosity of Filter-Cel press cakes, the valuable solutions may be washed out with a minimum quantity of solvent and the recovery thereby increased.

Applications The following liquids are filtered with Filter-Cel on a large scale

- Adhesives
- Alcoholic extracts
- Antitoxins and serums
- Cane syrups
- Castor oil
- Cereal beverages
- Cider
- Cocoanut oil
- C. P. chemicals
- Corn oil
- Cottonseed oil
- Citric acid
- Dyestuffs
- Fish oil
- Flavoring extracts
- Fruit juices
- Glucose
- Glycerine
- Grapefruit juice
- Lemon juice
- Lime juice
- Linseed oil
- Liquid soap
- Lubricating oil and used automobile oils
- Maltose
- Metallurgical solutions
- Milk sugar
- Molasses
- Peanut oil
- Pharmaceuticals
- Shellac
- Soap lye
- Sorghum syrups
- Soya bean oil
- Stearic acid
- Tannic acid
- Varnish and lacquer
- Vinegar
- Wine

The following paragraphs explain briefly the methods of filtration and quantities of Filter-Cel used.

Vegetable Oils Cocoanut, cottonseed, olive, peanut and raisin seed oils require complete clarification before hardening or marketing. This can be rapidly obtained by filtration with small quantities of Filter-Cel. Ordinarily 1/10 to 1/5% of Filter-Cel added just before filtration, is sufficient to obtain a rapid flow from the filter and a perfect separation of impurities.

Filter-Cel makes possible the filtration of these oils at reduced temperatures and thus insures permanent clarity.

Chemicals—The color and purity of many chemicals can be improved by giving their solutions a filtration with Filter-Cel before crystallization. This completely removes all suspended impurities, dust particles, etc., and permits the formation of crystals without contamination.

Syrups—Table syrups such as cane, sorghum, maltose, glucose and molasses often contain very finely divided suspended matter which renders the products unsalable or causes them to be classed as second grade. Quantities of Filter-Cel ranging from 1/10 to ½% make it possible to filter rapidly and obtain bright, sparkling products. In some cases, the use of lime and sulphur dioxide can be dispensed with, and the product simply given a filtration with Filter-Cel. In this way, contamination and impairment of the flavor are avoided.

Dyestuffs- These products must be clarified completely in the intermediate processes of manufacture so that the final products will have the highest possible purity. Filter-Cel is used effectively to remove amorphous sulphur, iron oxide, zinc sludge, carbon, pitch and other residues. Filter-Cel has made possible a sharp separation between solids and liquids and thereby increases the extraction and recovery of these products.

Cereal Beverages—Products of this character must be filtered perfectly not only for the sake of the appearance of the product, but also to insure the complete removal of yeast. This is especially important for products shipped in bulk or in kegs and that cannot be pasteurized. Filter-Cel in quantities of from ¼ to ½ oz. per gallon of beverage is thoroughly mixed with the beverage as it is drawn from the fermenting vats and just before filtration in a pressure filter.

SERVICE

This company will gladly extend the advice and assistance of its technical staff without obligation. Our laboratory will filter samples of your product and submit them for your inspection together with complete data on the process. Samples of Filter-Cel for testing and experimental use may be obtained upon request.

CARY MANUFACTURING COMPANY

Manufacturers of Packers and Shippers Specialties

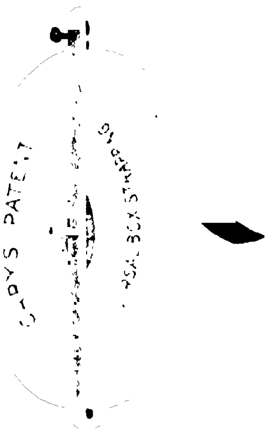
MANHATTAN BRIDGE PLAZA, BROOKLYN, N. Y.

PRODUCTS

"Universal" Box Strapping, Box Corner Fasteners, Bung Fasteners, Twisted and Self Tightening Round Wire Box Strap, Flat Wire Box Strap, Bale Buckles and Bands, Saw Edge and Plain Edge Divergent or Parallel Corrugated Fasteners, Protective Seals, Wire Clasps, Flexible Steel Matting.

BOX STRAPPING "UNIVERSAL"

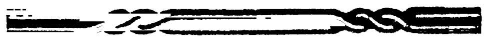
Universal Box Strapping is made from soft annealed steel, through which nails can be easily driven without first punching a hole. This strapping is made in widths of ½, ⅝, ¾ and one inch, put up in reels of 300 feet each, packed 20 reels to a case, also supplied in lengths cut to specifications.



REEL OF "UNIVERSAL" BOX STRAPPING

BOX STRAPPING WIRE "SELF TIGHTENING"

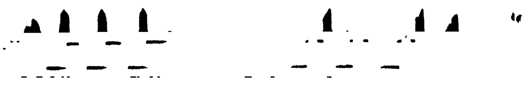
Our Self Tightening Wire Box Strapping is made in sizes of No. 14, 15, 17 ga. coppered or galvanized round wire. Put up in reels of 5000 feet, also in lengths cut to specifications.



SECTION OF "SELF-TIGHTENING" BOX STRAPPING WIRE

BOX CORNER FASTENERS

Our Box Corner Fasteners are manufactured from the finest grade of Hot Rolled Strip Steel, insuring a finished product that will drive into wood and hold. These fasteners are made in numerous styles and sizes. Our "Teeth" style being illustrated.



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CORRUGATED STEEL FASTENERS

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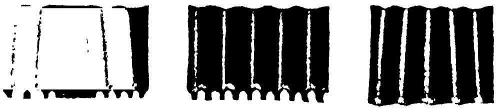
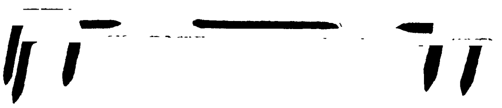


Divergent Parallel Divergent

CORRUGATED STEEL FASTENERS

SKELETON CLASPS

Our Skeleton Clasps are used extensively on small cases, boxes, tubs, etc. This clasp bends squarely around corners of boxes without fracturing. Made in five sizes, 2" to 3¾" inclusive.



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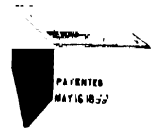
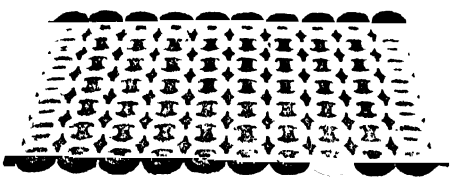
An efficient guard against pilferage. Made in sizes of ½ and ⅝ inch.



PROTECTIVE SEAL

STEEL DOOR MATS "EVERLASTING"

Made from the best grade of Cold Rolled Strip Steel, thoroughly galvanized before being assembled. Made in twelve stock sizes, also irregular sizes to order. Used in elevators, entrances, corridors, factories, residences, anywhere that dirt and wet prevail. Send for sample and special literature.



"EVERLASTING" STEEL DOOR MAT

CHATTANOOGA BOILER & TANK COMPANY

Main Office and Works
CHATTANOOGA, TENN.

PRODUCTS

Tanks for all General and Special Purposes:

Tanks for the manufacture and storage of Sulphuric, Nitric and Mixed Acids.

Tanks for the manufacture and storage of Benzol and Toluol.

Creosote Tanks.

Grain Tanks.

Ice Tanks.

Rendering Tanks.

Gasoline, Oil and Petroleum Product Tanks.

Cottonseed Storage Tanks.

Bleaching Tanks.

Kier Tanks.

Paper Manufacturing Tanks.

Silicate Soda Tanks.

Alum Manufacturers' Tanks.

Soap Stock, Rosin and Brine Tanks.

Molasses and Sugar Tanks.

Barium Process Tanks.

Tanks for manufacture and storage of Green Gum or Wood Turpentine.

Water Tanks, Towers and Standpipes.

Bins.

ACID TANKS

The various steps in acid processes can not be handled with the same material. Any material from steel to lead lined tanks is furnished. Also, cooler frames of steel or shipped complete with lead coils and lining. Acid work is a very important subject, and our plant is specially equipped to render the latest and best practice.

TOWERS, TANKS AND STANDPIPES

The consulting department will advise whether towers and tanks, or standpipes, are the most economical for condition presented.

BINS

For the storage of various materials.

STOCK SHIPMENT

We carry a large stock of plate and other necessary materials, and are prepared to ship promptly tanks up to 500,000 gallons capacity.

CO-OPERATION AND SERVICE

This company makes a specialty of tank design and construction, and has spent and is spending much money and time on mechanical and chemical investigation.

Experience places it in a position to offer valuable advice on tanks required for all general purposes. In the consulting department is one of the country's most capable and successful chemical engineers, who can be consulted for special propositions.

With this service and an up-to-date shop, the company gives more value, from beginning to end, than is obtainable elsewhere.

With an immense stock of materials, quick shipments, together with other advantages, are guaranteed.

ESTIMATES, ETC.

Information and estimates will be furnished on request.

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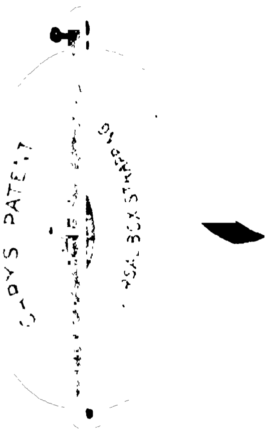

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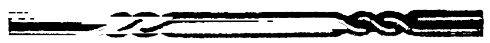

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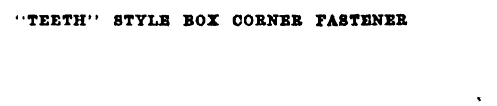

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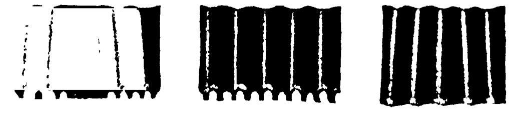

Divergent Parallel Divergent

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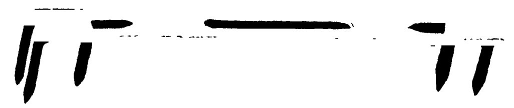

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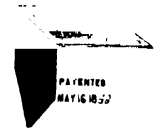

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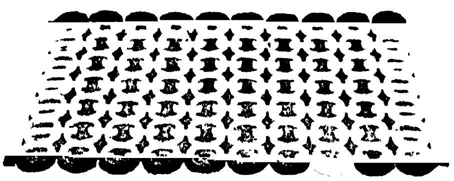


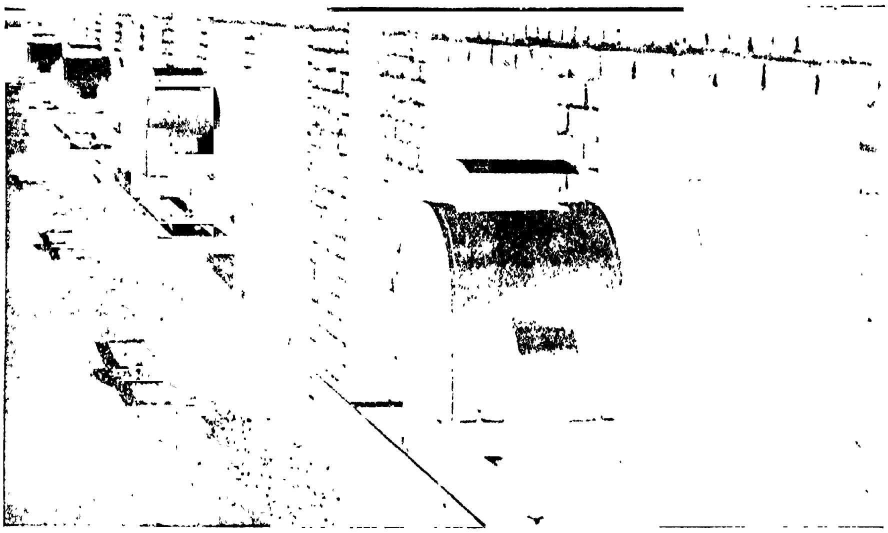
"EVERLASTING" STEEL DOOR MAT

Will handle 5000 cubic feet of air per hour, consuming about 10 watts or 1/80 H P.

Automatically the fan disc is opened and closed and can be applied to all sizes.

FOUR LEAF CLOVER BLOWERS AND EXHAUSTERS

Four Leaf Clover Blowers and Exhausters represent a new departure in blower construction, having been placed upon the market after extended and thorough investigation and tests.



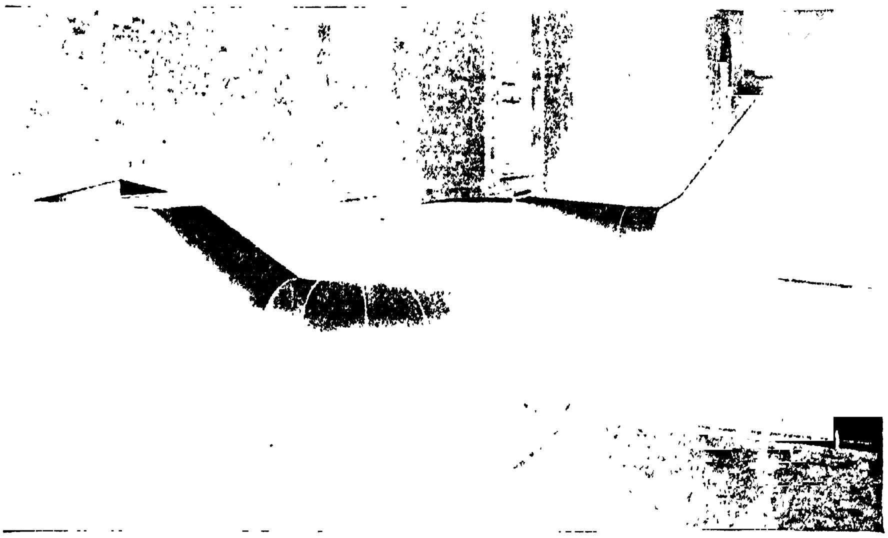
OUTSIDE WALL INSTALLATION DISCHARGING ETHER FUMES

They have a complete wide range of application for all blower and exhaust work and due to the scientific construction of the blast wheel and housing are unsurpassed for efficiency, large capacity, rigidity, durability and positive action

Greater efficiency with reduction in power consumption for a given amount of air handled is one of the salient features

Built for volume or pressure with bottom horizontal, top horizontal, up-blast and down-blast, discharge and for belt-drive or direct connection of motors, steam turbines or high speed engines.

There is a size for every requirement; capacity, tables and complete data sent on request.



FOUR LEAF CLOVER BLOWER

CHEMICAL EQUIPMENT COMPANY

Engineers and Manufacturers

2451-59 SO. WESTERN AVE., CHICAGO, ILL.

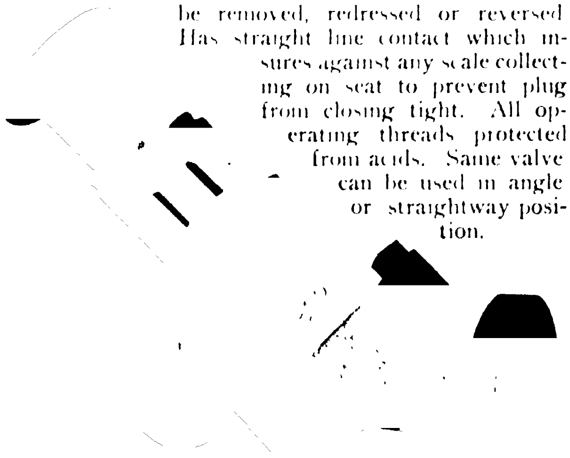
CECO
Trade-Mark
Reg U S Pat Off

PRODUCTS

"Ceco" Valves; Centrifugal Pumps; Special Machinery; Spray Systems for Cooling, Evaporating, Air and Gas Washing, Gas Absorption; Evaporators.

VALVES

Designed for Chemical Plant conditions Seat can be removed, redressed or reversed Has straight line contact which insures against any scale collecting on seat to prevent plug from closing tight. All operating threads protected from acids. Same valve can be used in angle or straightway position.



CECO VALVE ASSEMBLED IN THE STRAIGHTWAY POSITION

Valve	1"	1½"	2"	2½"	3"	4"
Face to face	7⅝"	9"	10¼"	11½"	12⅝"	14¼"
Dia of flanges	4"	5"	6"	7"	7½"	9"

Dia of bolt circle Drilled only to specification

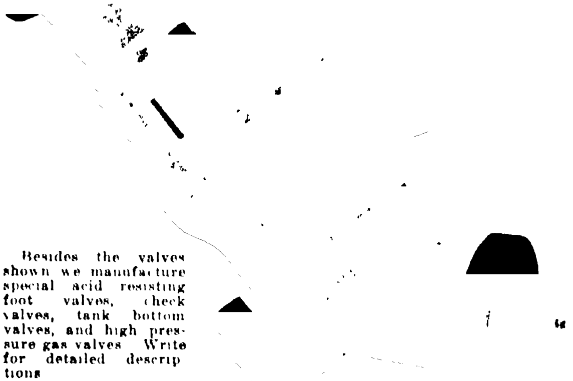
The stem is of the rising type, freely hung so as to prevent turning when seating, and has no threads or other close fitting parts The operating threads are within and always covered by the hand wheel Threads of large pitch diameter are used thus insuring easy operation even with a small handle

Compression on the packing is obtained by means of a single threaded gland follower having its threaded portion always covered by the handle This avoids the use of the conventional but troublesome packing studs

In order to obtain maximum life from the valve, both seating members are made removable and a type of seat is used which is practically self cleaning The disk is reversible and may be easily redressed

By making the body in two parts divided at an angle of 45° it is quite easy to convert this valve from angle to straightway or vice versa

We not only furnish valves in the more common metals such as lead, iron, bronze, aluminum, monel, etc., but have also developed a number of special alloys which can be used.

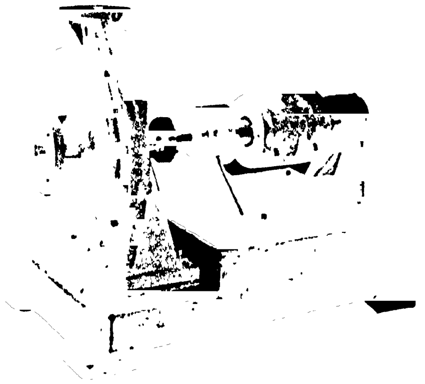


Besides the valves shown we manufacture special acid resisting foot valves, check valves, tank bottom valves, and high pressure gas valves Write for detailed descriptions

CECO VALVE ASSEMBLED IN THE ANGLE POSITION

PUMPS

For Acid Plant problems, with the smallest number of working parts and minimum cost to repair or replace. Deep stuffing box which can be packed easily. No end thrust on impeller. Cannot become gas- or steam-bound. Made belt drive or direct motor connected.



BELT DRIVEN PUMP

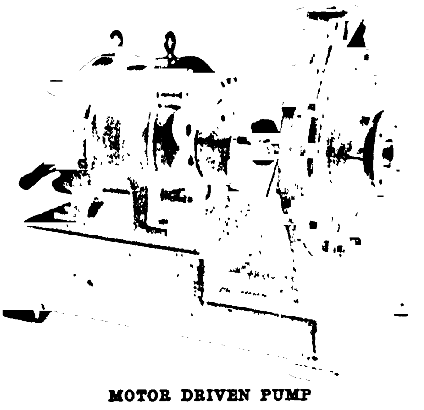
Pump	AA	A	B	C
Suction	1½"	2"	2½"	8"
Discharge	1"	1½"	2"	2½"
Normal cap. in G.P M	25	70	110	160

By properly designing the CECO horizontal pump we have been able to produce a unit from which all complication has been removed, and which stays in service.

Pumps are made of lead, iron, aluminum, bronze, monel, and other metals and alloys.

Data Required for Estimates

1. What liquid to be pumped?
   Give temperature and physical condition.
2. Gallons per minute to be pumped.
3. Total head, include losses
4. Suction lift in feet
5. Motive power, whether belt or motor drive. Give full electrical information



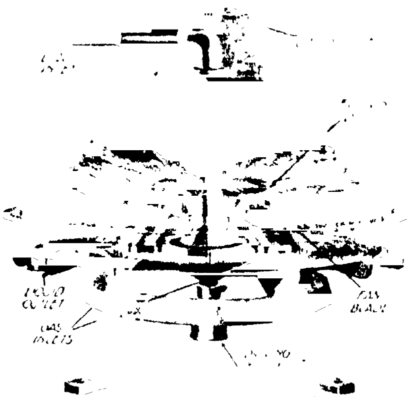
MOTOR DRIVEN PUMP

We also manufacture double stage pumps of a type similar to the above Also blowers and exhaust fans for handling corrosive gases and vapors. Write for literature.

Continued on Next Page

SPRAY SYSTEMS

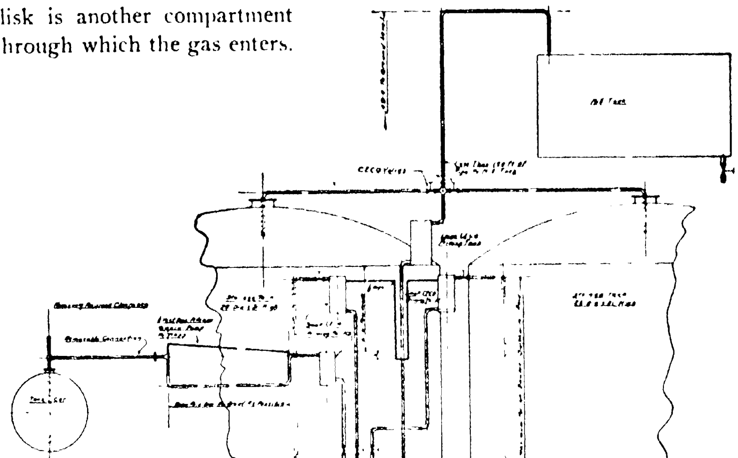
Adapted to Absorption of Gases in Liquids, Cooling of Gases, Gas and Air Washing, Liquid Cooling with Air or Gas. Evaporation problems and the deodorizing of oils.



CECO SPRAY SYSTEM

Dia of disk	6"	12"	24"
Dia of body	21¼"	42¾"	65½"
Max height over all	20⅝"	37¼"	51⅝"

Description—A revolving disk is mounted on suitable bearings, provided with oil circulation and cooling if required. The disk is driven through a vertical shaft by a belt or motor. Surrounding disk is a compartment the upper wall of which is cone-shaped. Below disk is another compartment through which the gas enters.

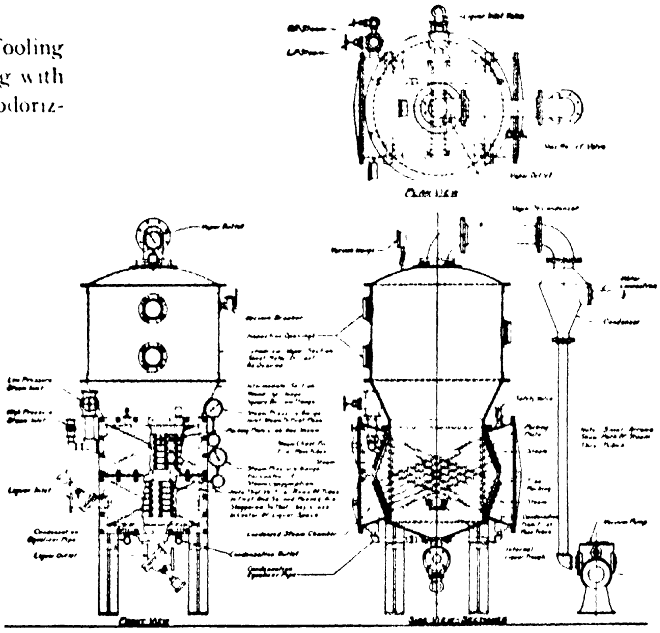


CECO PUMPS AND AUTOMATIC PRIMING SYSTEM FOR UNLOADING TANK CARS OF ACID

Operation: (a) Take acid out of tank cars and deliver into either Storage Tank or into Mill Tank

(b) Take acid out of top of either Storage Tank and deliver to Mill Tank or elsewhere if desired.

Advantages:
(1) Low Initial Cost—Much less than air installation
(2) Low Power Cost—Less than ½ the cost of air
(3) Simple to Operate—No priming necessary—Automatic.
(4) Leaks Avoided—Tank car not under pressure or vacuum. —Bottom outlet in Storage Tanks eliminated.
(5) Ample Capacity—Will unload car in about two hours. —Will deliver to Mill Tank at any desired rate.



CECO VACUUM EVAPORATOR

VACUUM EVAPORATORS

CECO **Vacuum Evaporators** are manufactured in single and multiple effects for evaporating liquors under vacuum and pressure by exhaust or live steam.

CECO return, downward, slanting tubes which are staggered, giving a natural flow of the condensation to the drains, leaving tube area free to transmit the heat to the liquid, also increasing the velocity of the steam through the tubes, giving a greater transmission of heat to liquid, and causing a more rapid and positive circulation of the evaporating liquid.

The liquor chamber is of rectangular shape with a minimum of liquor, which insures a much greater boiling capacity.

The vapor chamber is circular shape, giving maximum steam expansion area, insuring no entrainment, thereby doing away with all catchalls.

The liquid is brought into evaporator body by a special trough which distributes the liquid through the entire width of the evaporator, making an even distribution into the boiling liquid.

Tubes are so arranged that cleaning the bottom of the evaporator body can be done without removing the tubes

Condensation equalizing pipes from the back steam chest to the front steam chest and from the front steam chest to the drain pipe insures freedom of water in these parts.

CHEMICAL EQUIPMENT COMPANY

Engineers and Manufacturers

2451-59 SO. WESTERN AVE., CHICAGO, ILL.

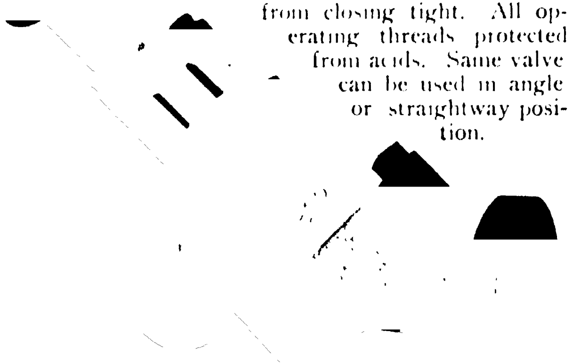
CECO
Trade-Mark
Reg U S Pat Off

PRODUCTS

"Ceco" Valves; Centrifugal Pumps; Special Machinery; Spray Systems for Cooling, Evaporating, Air and Gas Washing, Gas Absorption; Evaporators.

VALVES

Designed for Chemical Plant conditions Seat can be removed, redressed or reversed Has straight line contact which insures against any scale collecting on seat to prevent plug from closing tight. All operating threads protected from acids. Same valve can be used in angle or straightway position.



CECO VALVE ASSEMBLED IN THE STRAIGHTWAY POSITION

Valve	1"	1½"	2"	2½"	3"	4"
Face to face	7⅝"	9"	10⅛"	11½"	12⅝"	14¼"
Dia of flanges	4"	5"	6"	7"	7½"	9"

Dia of bolt circle Drilled only to specification

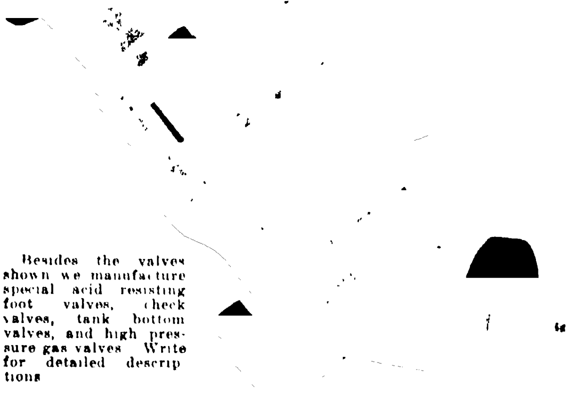
The stem is of the rising type, freely hung so as to prevent turning when seating, and has no threads or other close fitting parts The operating threads are within and always covered by the hand wheel Threads of large pitch diameter are used thus insuring easy operation even with a small handle

Compression on the packing is obtained by means of a single threaded gland follower having its threaded portion always covered by the handle This avoids the use of the conventional but troublesome packing studs

In order to obtain maximum life from the valve, both seating members are made removable and a type of seat is used which is practically self cleaning The disk is reversible and may be easily redressed

By making the body in two parts divided at an angle of 45° it is quite easy to convert this valve from angle to straightway or vice versa

We not only furnish valves in the more common metals such as lead, iron, bronze, aluminum, monel, etc., but have also developed a number of special alloys which can be used.

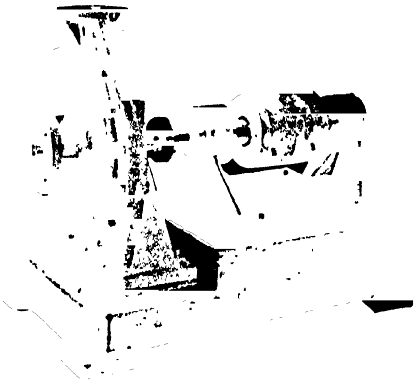


Besides the valves shown we manufacture special acid resisting foot valves, check valves, tank bottom valves, and high pressure gas valves Write for detailed descriptions

CECO VALVE ASSEMBLED IN THE ANGLE POSITION

PUMPS

For Acid Plant problems, with the smallest number of working parts and minimum cost to repair or replace. Deep stuffing box which can be packed easily. No end thrust on impeller. Cannot become gas- or steam-bound. Made belt drive or direct motor connected.



BELT DRIVEN PUMP

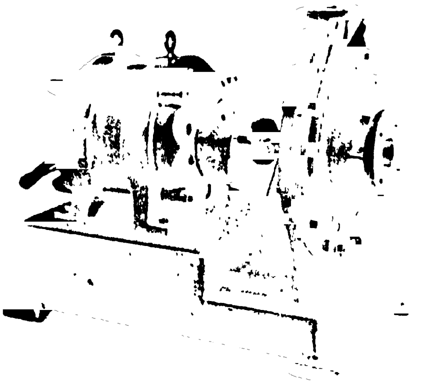
Pump	AA	A	B	C
Suction	1½"	2"	2½"	3"
Discharge	1"	1½"	2"	2½"
Normal cap. in G.P M	25	70	110	160

By properly designing the CECO horizontal pump we have been able to produce a unit from which all complication has been removed, and which stays in service.

Pumps are made of lead, iron, aluminum, bronze, monel, and other metals and alloys.

Data Required for Estimates

1. What liquid to be pumped?
   Give temperature and physical condition.
2. Gallons per minute to be pumped.
3. Total head, include losses
4. Suction lift in feet
5. Motive power, whether belt or motor drive. Give full electrical information



MOTOR DRIVEN PUMP

We also manufacture double stage pumps of a type similar to the above Also blowers and exhaust fans for handling corrosive gases and vapors. Write for literature.

Continued on Next Page

CHESAPEAKE COPPERSMITH CO.

Manufacturers of
Copper Chemical Equipment
Kenwood Avenue and Elliott Street
BALTIMORE, MD.

PRODUCTS

Copper Chemical Equipment including:

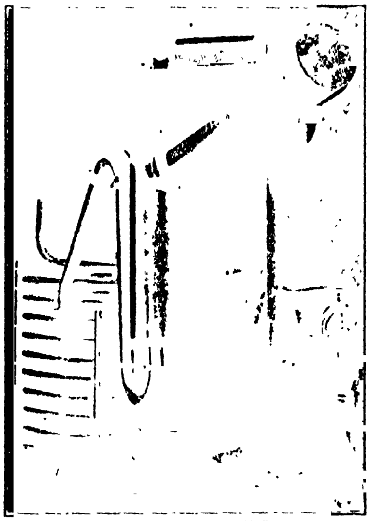
- Autoclaves
- Coils
- Condensers
- Copper Kettles, with or without Steam Jackets
- Digesters
- Funnels
- Percolators
- Stills
- Strainers
- Tanks
- Vacuum Pans
- Varnish Kettles, etc.

EXPERIENCE

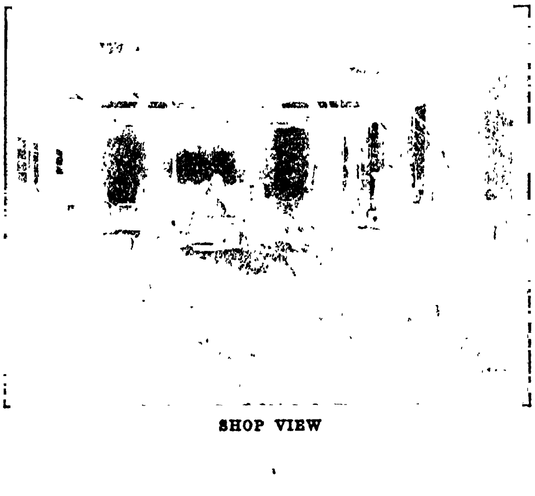
We have had a long experience in the manufacture of copper equipment used by all industries. As a result our coppersmiths are well trained, which insures superior workmanship in all classes of work.

FACILITIES

Our plant is modern and well equipped in every particular, to build any kind of copper apparatus. We are pleased to quote prices at all times and prompt attention is assured.



COPPER CONDENSER



SHOP VIEW

COILS

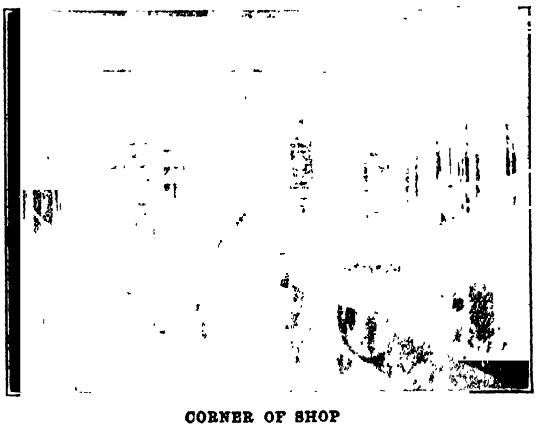
We are prepared to manufacture practically anything in the line of tube and pipe coils. A few uses to which our coils may be applied are the following:

- Transformer cooling
- Acid-warming
- Boiling
- Cooling
- Heating
- Evaporating
- Condensing

COPPER COILS AND BENDS

VACUUM PANS, MANUFACTURING SIZES

The capacities of these sizes range from 50 to 1000 Gals. The larger types are made with lugs on the sides, unless legs are specified in the order. All piping and valves are supplied and are standard. If floor space is limited special lengths of pipe and other connections can be delivered on the order. Receivers for the liquors are connected to a header so that various fractions can be recovered and separated without shutting down or interrupting the run. Attached to the agitator are two bevel gears, facing, so that by shifting the drive a counter-current can be set up and the contents thoroughly dehydrated.



CORNER OF SHOP

CHESAPEAKE IRON WORKS

Steel Structures, Bridges
Chesapeake Electric Traveling Cranes
General Machine Work

NEW YORK OFFICE Singer Building

BALTIMORE, MD.

Cable Address "CHES IRON"
Baltimore, Md Western Union Code

PRODUCTS

- Steel Structures and Bridges
- Electric Traveling Cranes
- General Machine Work

STRUCTURAL STEEL WORK

We fabricate and erect steel structures of all descriptions, including bridges Bethlehem and standard shapes carried in stock.

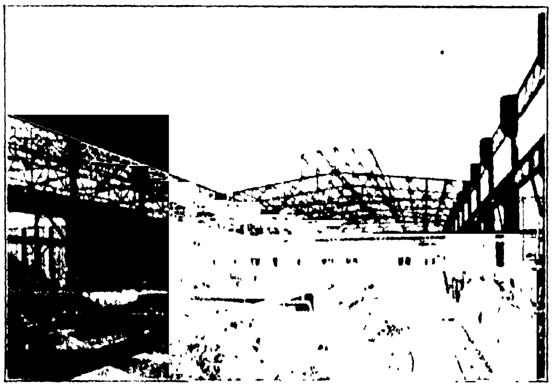
THE "CHESAPEAKE CRANE"

"Most Rugged Crane Built.".

All parts accessible and "standardized." Wearing parts extremely heavy for maximum life under adverse conditions Ask for details.

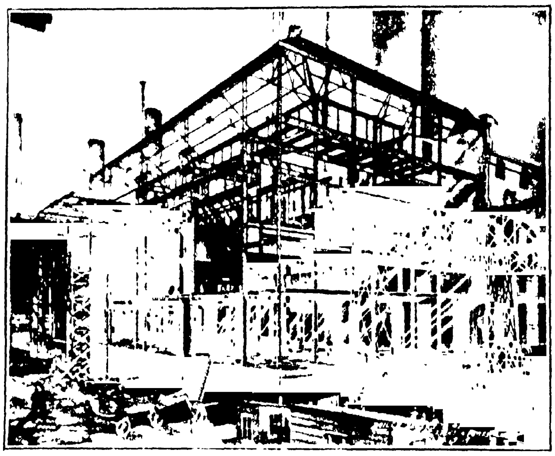
GENERAL MACHINE WORK

High efficiency machine shop facilities for outside companies not organized on "maximum production" basis.



TANK BUILDING, BALTIMORE COPPER SMELTING & ROLLING CO , BALTIMORE, MD

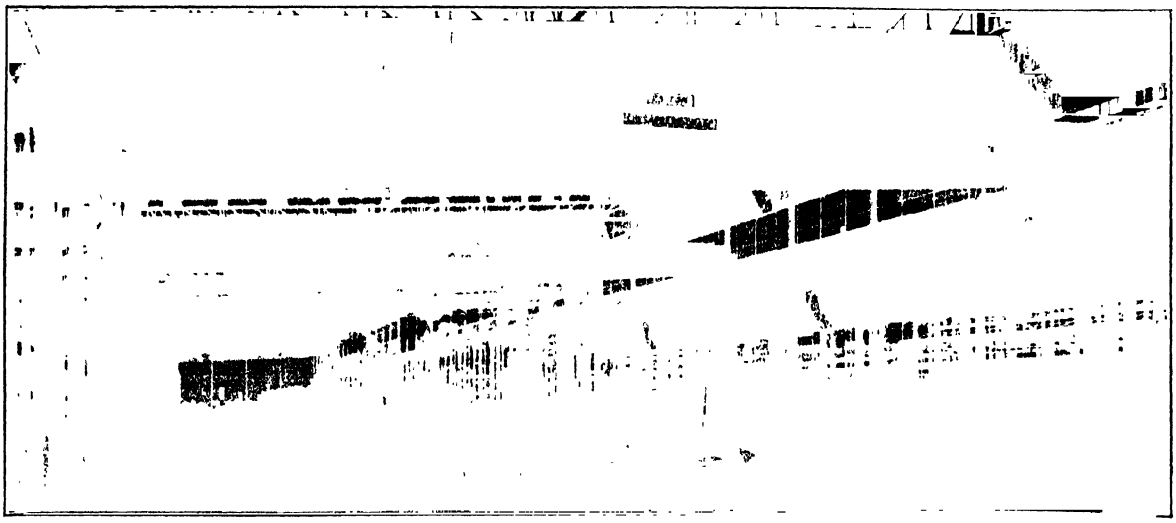
All steel work in this building furnished by Chesapeake Iron Works, Baltimore, Md



WESTPORT POWER STATION BOILER HOUSE OF CONSOLIDATED GAS, ELECTRIC LIGHT AND POWER CO , BALTIMORE, MD.

Over 90% of all steel work in this Power House furnished by Chesapeake Iron Works, Baltimore, Md

This Westport Power House is the largest Electric Central Station under one roof south of New York.



TWO OF NINE CHESAPEAKE CRANES, EASTERN ROLLING MILLS, BALTIMORE, MD.

25 tons each. 10 ton auxiliary hoist. Built by Chesapeake Iron Works, Baltimore Md.

CHICAGO BRIDGE & IRON WORKS

Designers, Manufacturers and Constructors of

Elevated Steel Water Tanks, Storage Tanks, Standpipes and Self Supporting Steel Stacks

OFFICES

Chicago, Ill., 2043 Old Colony Building
New York, N. Y., 3142 Hudson Terminal Building
Dallas, Tex., 1636 Praetorian Building
Charlotte, N. C., 809 Realty Building
Havana, Cuba, Edificio Abreu 402

Atlanta, Ga., 1022 Forsyth Building
Los Angeles, Cal. 1202 Wright & Callender Building
San Francisco, Cal. 1005 Call Building
Seattle, Wash., 95 L. C. Smith Building
Montreal, Que., Can., 1055 Bank of Toronto Building

WORKS

Eastern Plant
Greenville, Pa. (Pittsburgh District)

Central Plant
Chicago, Ill.

Canadian Plant
Bridgeburg, Ont., Can.

PRODUCTS

Elevated Steel Water Tanks, Storage Tanks, Standpipes and Chemical Service Tanks. Also, Acid Tanks, Paper and Sugar Plantation Equipment, Coaling Stations and all classes of Heavy Plate Metal Work.

TANK FOR PROCTER & GAMBLE HAMILTON, ONTARIO
Capacities, 50,000 and 100,000 gallons. Heights, 100 and 50 feet to bottom.

STANDARD STORAGE TANKS

Capacity, Gallons	Diam	Height
10,000	12' 3"	11' 9"
15,000	15' 0"	11' 9"
20,000	17' 4"	11' 9"
25,000	16' 0"	17' 6"
30,000	17' 4"	17' 6"
40,000	20' 0"	17' 6"
50,000	22' 4"	17' 6"
60,000	21' 3"	23' 3"
75,000	23' 9"	23' 3"
100,000	27' 4"	23' 3"
150,000	30' 0"	29' 0"
200,000	34' 6"	29' 0"
250,000	38' 6"	29' 0"
300,000	42' 0"	29' 0"
400,000	49' 0"	29' 0"
500,000	54' 3"	29' 0"
600,000	60' 0"	29' 0"
750,000	66' 3"	29' 0"
1,000,000	77' 0"	29' 0"
1,500,000	94' 0"	29' 0"
2,000,000	108' 4"	29' 0"

HORIZONTAL CYLINDRICAL TANKS

Capacity Gallons	Diam	Length
1,000	3' 10"	11' 9"
2,000	5' 5"	11' 9"
2,500	5' 0"	17' 6"
3,000	5' 5"	17' 6"
4,000	6' 3"	17' 6"
5,000	7' 0"	17' 6"
6,000	7' 8"	17' 6"
7,500	7' 6"	23' 3"
8,000	7' 8"	23' 3"
10,000	7' 8"	29' 0"
12,000	8' 7"	29' 0"
15,000	8' 7"	34' 9"
20,000	10' 0"	34' 9"
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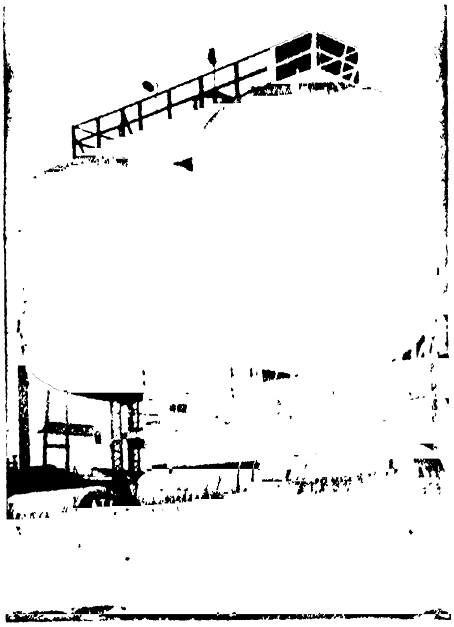
We have designed, fabricated and erected Plate Metal Work for the leading chemical companies of the United States and Canada.



ACID STORAGE TANKS, NIXON NITRATION WORKS, NEW BRUNSWICK, N. J.
Capacity, 60,000 gallons each. Height, 20 feet to bottom. These Tanks are built of heavy plates, and are of sufficient height to load tank cars by gravity.

SPECIFY OUR STANDARDS

We can make more attractive prices and ship more promptly when you do so

CATALOG

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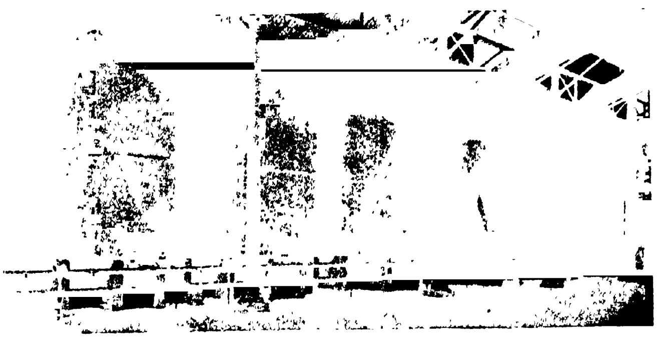
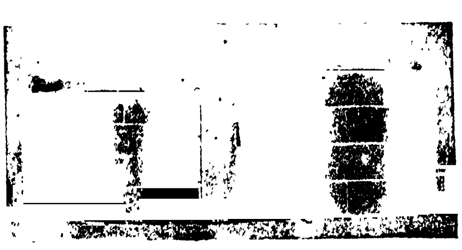


A BATTERY OF FERMENTATION TANKS, CURTIS BAY DISTILLERY CO., SOUTH BALTIMORE, MD.



TWO MOLASSES TANKS, GREAT WESTERN SUGAR CO., GERING, NEB. DIAMETER 35 FEET. HEIGHT 23 FEET

CHICAGO PNEUMATIC TOOL COMPANY

CHICAGO PNEUMATIC BUILDING
6 EAST 44TH STREET, NEW YORK, N. Y.

SALES AND *SERVICE BRANCHES ALL OVER THE WORLD

*Birmingham
*Boston
*Buffalo
*Chicago
*Cincinnati
*Cleveland
*Detroit
El Paso
Erie
Franklin
Houston
Joplin
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*New Orleans
*New York
*Philadelphia
*Pittsburgh
Richmond
Salt Lake City
*San Francisco
*Seattle
*St Louis
Basle
*Berlin
Bombay
Brussels
Buenos Aires
Christiania
Copenhagen
*Fraserburgh
Havana
Helsingfors
Honolulu
Johannesburg
*London
Manila
Milan
Montevideo
*Montreal
Osaka
Paris
Rio de Janeiro
*Rotterdam
Santiago
Sao Paulo
Seoul
Shanghai
Tientsin
Tokyo
Toronto
Vancouver
Winnipeg

PRODUCTS

Boyer Pneumatic Hammers; Little Giant Pneumatic and Electric Tools; Chicago Pneumatic Air and Gas Compressors; Vacuum Pumps; Pneumatic hoists; Giant Oil and Gas Engines; Rock Drills; Coal Drills.

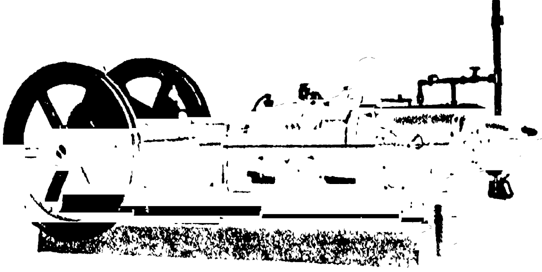
CHICAGO PNEUMATIC COMPRESSORS

Chicago Pneumatic Air and Gas Compressors are built in 500 distinct sizes and types, a fact which emphasizes the Company's ability to supply an air power plant of correct design and proportion regardless of capacity required or operating conditions. Standard sizes are built for steam, belt, electric, motor, oil, gas or gasoline engine drive and in single, duplex and duplex-tandem types.

CHICAGO PNEUMATIC TWO-STAGE DIRECT CONNECTED MOTOR DRIVEN COMPRESSOR, CLASS O-CE

C-P Duplex Air Compressors—Class O, are steam, belt and motor driven. They meet every requirement of manufacturing plants. Built in medium and large capacities. Large belt driven and direct mounted motor driven compressors are essentially constant speed machines. Therefore, these compressors are furnished with a variable volume control, by means of which the compressors operate at full, half and no load with maximum economy. Ask for Bulletin 400.

Chicago Pneumatic Oil Driven Air Compressors—These compressors combine in one unit the highly perfected Giant Oil Engine and the Chicago Pneumatic Simplate Valve Air Compressor.



CHICAGO PNEUMATIC OIL DRIVEN AIR COMPRESSOR

Simplicity of operation and ability to use cheap fuels economically and the absence of stand-by losses are further distinct advantages. Built in a variety of sizes. They operate successfully on oils of 28° Baumé scale up to and including kerosene.

The net cost of operation of these machines is frequently less than 50 per cent. of that of an equivalent steam unit. Tank mounted, stationary, or skid-mounted units are available. All operate successfully on low grade fuel oils even under widely different climatic conditions. Ask for Bulletin 607.

The same style units, both portable and stationary, are built for operation on gas and gasoline. Ask for Bulletin 34-Y.

FUEL OIL, GAS AND GASOLINE DRIVEN COMPRESSORS

Class N SO 2 Fuel Oil Driven, Stationary Type

Piston Displacement cu ft	R P M	Maximum H P	Floor Space ft in	Code Word
144	325	21	11-9 x3-5	AVARACCIO
212	325	29	13-6 x3-8	AVARAN
309	300	47	15-4 x4-7	AVARE
370	250	57	18-3 x5-7	AVARETTO
507	240	77	21-6 x6-0	AVARGOR
658	230	102	21-10x6-0	AZADONES

Class N Compressors—Built in single-stage, steam and belt driven types.

CHICAGO PNEUMATIC SHORT-BELT MOTOR DRIVEN AIR COMPRESSOR, CLASS N-SBE

Where the demand for air is very intermittent, these compressors can be furnished with motors controlled by automatic starters and pressure regulators, the function of which is to shut down the motor when the pressure in the air receiver reaches the predetermined maximum, and to start the motor when the air reaches the predetermined minimum. This results in a considerable saving of power.

Air Cylinder		R P M	Piston Displacement cu ft	Air Pressure lb	H P * Required	Code Words	
Diam in	Stroke in					Steam Driven Type†	Belted Type
6	6	350	69	80-125	9- 11	NASBREL	NABABSOM
7½	6	350	107	50-100	13- 17	NASDICK	NABACRID
8	8	300	139	80-125	21- 26	NASENNA	NABADORA
9	8	300	176	70-100	24- 30	NESEPTOR	NEBAEGGER
10	8	800	218	40- 70	24- 31	NESFENTO	NEBAFFLING
12	8	300	314	15- 40	20- 34	NESGRIP	NEBAGGOT
10	10	275	250	80-125	39- 48	NESHOLE	NEBAHIA
12	10	275	360	50-100	45- 62	NISIMULE	NIBAJIRN
15	10	275	562	30- 50	53- 79	NISKINE	NIBAJOS
17	10	275	723	15- 30	45- 68	NISLAKE	NIBAKLET
12	12	250	392	80-125	63- 78	NISMURK	NIBALENA
14	12	250	534	50-100	70- 94	NOSNACCO	NOBAMPO
17	12	250	788	30- 50	76-103	NOSOMULA	NOBANDIS
20	12	250	1092	15- 30	65-107	NOSOSTRIS	NOBAOLA
14	14	220	549	80-125	96-123	NOSPARRY	NOBAPTIST
17	14	220	809	40- 80	100-141	NOSQUAN	NOBAQUA
20	14	220	1120	15- 40	75-135	NUSRAID	NUBARON

*For belt driven compressors, this includes belt loss; for steam driven compressors, the figures stated are the I.H.P. (indicated horsepower) in the steam cylinder

Continued on Next Page

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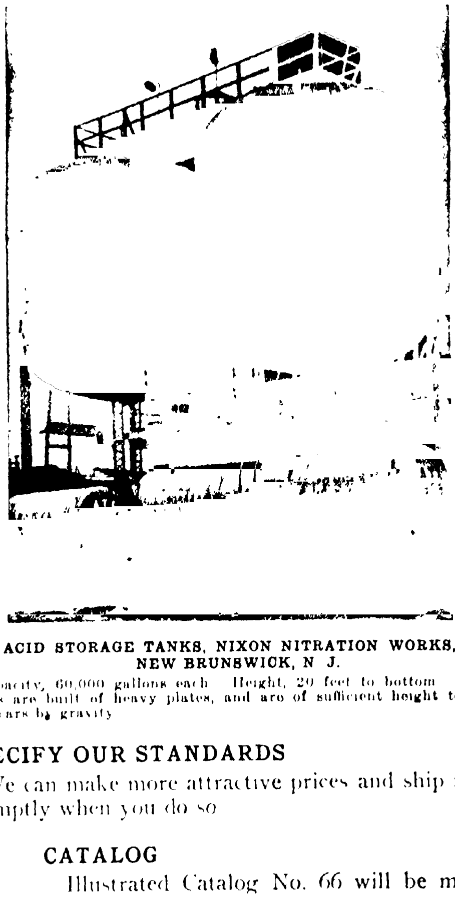

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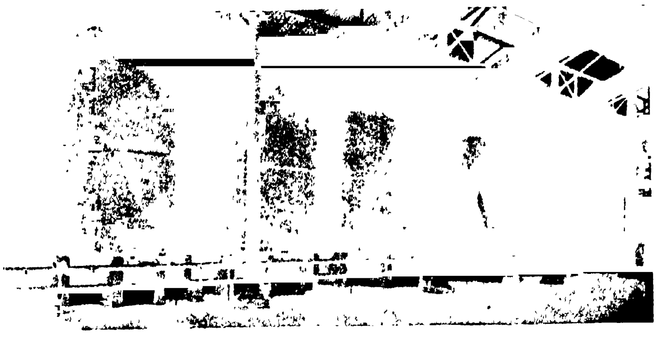

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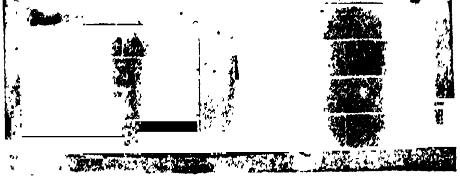


TWO MOLASSES TANKS, GREAT WESTERN SUGAR CO., GERING, NEB. DIAMETER 35 FEET. HEIGHT 23 FEET

***STANDARD TYPE BOYER RIVETING HAMMERS**

Size and Style	Piston Diam in	Length Stroke in	Capacity (Rivets) in	Weight Net lb	Weight Shpg lb	Code Word
50	1 1/16	5	3/4	20	24	AARONICAL
60	1 1/16	6	7/8	23	29	ABACIST
80	1 1/16	8	1 1/8	25	32	ABACOT
90	1 1/16	9	1 1/4	26	33	ABACTOR
80x	1 1/16	8	1 1/2	21 1/2	32	ABACEPS

***HEAVY TYPE BOYER RIVETING HAMMERS**

Size and Style	Piston Diam in	Length Stroke in	Capacity (Rivets) in	Weight Net lb	Weight Shpg lb	Code Word
60	1 1/8	6	7/8	26	31	ABACISTERN
80	1 1/16	8	1 1/8	28	35	ABACOTEM
90	1 1/16	9	1 1/4	29	36	ABACTUS

TYPE H BOYER RIVETING HAMMERS

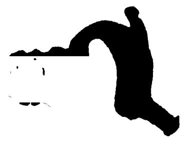
Size and Style	Piston Diam in	Length Stroke in	Capacity (Rivets) in	Weight Net lb	Weight Shpg lb	Code Word
H 3	1 1/16	3	3/8	12	15 1/2	ABABSOM
H 4	1 1/16	4	1/2	12 1/2	16	ABABSTER

Note. Equipment with any of the foregoing hammers includes hose nipple and spring clip for holding rivet sets Rivet sets furnished at extra charge when ordered

*If desired any Boyer Standard or Heavy Type riveting hammer can be furnished with a closed handle having either inside or outside trigger instead of standard open type handle shown, at no additional charge An inverted handle, instead of Standard Handle, can be furnished at an additional charge

BOYER AND KELLER CALKING AND CHIPPING HAMMERS

Made in a complete range of sizes. Useful in every shop having compressed air, for chipping gray iron and steel castings and alloy steel ingots, calking seams, trimming flush head rivets, beading flues, etc. These are only a few of the jobs which can be performed at greater speed with less effort by the use of these tools. Ask for Bulletin 600.



BOYER "BK" TYPE CHIPPING AND CALKING HAMMER

***†BOYER "BK" CHIPPING AND CALKING HAMMERS**

Size and Style	Piston Diam in	Length Stroke in	Service for Which Adapted	Weight Net lb	Weight Shpg lb	Code Round	Code Hexagon
1	1 1/8	1	Light chipping	11 1/2	14	ABHUME	ABHURL
1 x	1 1/8	1 1/2	Med chipping	12 1/2	16	ABIABIC	ABIACTION
2	1 1/8	2	Gen chipping	13	16	ABIADUM	ABIDING
3	1 1/8	3	Hvy chipping	14 1/2	18	ABIGAIL	ABILITY
4	1 1/8	4	Ex hvy. chipg	15 1/2	21	ABIOLOGY	ABIOLUS

***BOYER CHIPPING, CALKING AND SCALING HAMMERS**

Size and Style	Piston Diam in	Length Stroke in	Service for Which Adapted	Weight Net lb	Weight Shpg lb	Code Round	Code Hexagon
F	15/16	1 1/4	Scal hammer	6 1/2	10	ABJECTION	ABJECTNESS
BB	1 1/16	1 1/2	Flue beading	9	13	ABDOMEN	ABDOMINAL
B	1 3/16	2	Light chipping	12	16	ABDIQUER	ABDITARY

***KELLER CHIPPING, CALKING AND SCALING HAMMERS**

Size and Style	Piston Diam in	Length Stroke in	Service for Which Adapted	Weight Net lb	Weight Shpg lb	Code Round	Code Hexagon
0	3/4	1 3/8	Scal. hammer	6	10	ABED	ABEILLE
‡	1 1/8	1 1/2	Scal. hammer	8	12	ACBELRIC	—
1	1 1/8	1	Light chipping	12	15	ABENSUR	ABERDEVINE
1-x	1 1/8	1 1/2	Med. chipping	13	16	ABERRANCE	ABERRANT
2	1 1/8	2	Gen chipping	13 1/2	17	ABERRATION	ABERRING
3	1 1/8	3	Hvy chipping	15	19	ABETTING	ABETTMENT
4	1 1/8	4	Ex hvy chipg	16	22	ABEYANTLY	ABHOR

*When ordering, specify "Round" or "Hexagon" bushings. Chisels furnished at extra charge.

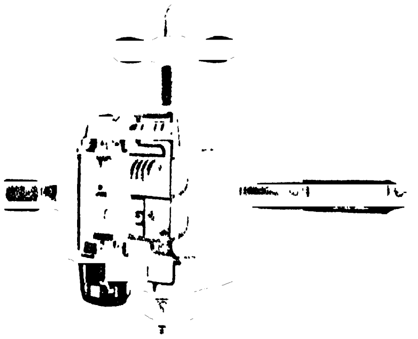
†In ordering, specify whether heavy or light type handle is desired The heavy type is standard. ‡Valveless.

"LITTLE GIANT" AIR DRILLS

For countless drilling, reaming, tapping, nut and bolt tightening, screw setting, flue-rolling and countersinking operations, no portable drilling machine yet devised has excelled the flexibility of "Little Giant" portable air drills. Built in a wide variety of types and sizes.

Features of design: Three-point ball-bearing crankshaft suspension. Three-unit housing. Stub-tooth gears, stronger and more compact than the involute type. Balanced piston valves, long-wearing and leakproof.

More than 125,000 "Little Giant" air drills are in successful use. They are preferred for portable work in shops; for heavy work and rough handling in shipyards, railway shops, boiler works, etc. Drilling up to 3 in. in steel, countersinking, reaming, tapping and flue rolling are rapidly accomplished with "Little Giants." Overloading does not affect them. Piece workers prefer "Little Giants" because they increase output and earnings.



CUTAWAY VIEW, NO. 2 "LITTLE GIANT" AIR DRILL

Made in reversible and non-reversible models, with different drilling speeds ranging from 50 to 2200 r.p.m.; with Square or Morse taper shank, and with feed-screw, grip handle or breast plate equipment. Ask for Bulletin 598.

"LITTLE GIANT" AIR DRILLS

‖†§ Size No		Speed Light, r p m	Air Used¶ per Min cu ft		Capacity° Drill in	Capacity° Ream	Capacity° Tap	Capacity° Flue Roll	Weight Net lb	Code
10 F		2200	11	00	1/4	–		–	8	ABOBELLA
10 S		1000	7	0	3/8	–	–		8 3/4	ABOBESTIC
3 S	(1)	1800	15	0	1/2				11 1/2	ABOCADLIC
3 RS	(1)	1200	15	0	1/2				11 1/2	ABORINFELT
3 A	(2)	800	15	1	5/8				12	ABOMASTER
4	(2)	800	20	2	7/8	1/2	5/8		22	ABOCAFE
4R	(2)	300	18	2	7/8	1/2	5/8	3/4	24	ABOBRAND
4T		370	18	2		1/2	5/8	3/4	24	ABOBREATH
4C	(2)	240	20	3	1 1/4	1 1/4	1 1/4		28	ABOBROOM
4RC	(2)	125	18	3	1 1/4	1 1/4	1 1/4	2	30	ABOBRITISH
4TC		130	18	3	–	1 1/4	1 1/4	2	30	ABORIDE
2	(2)	480	25	3	1 1/4	1	1	–	40	ABOCALLA
2R	(2)	325	20	3	1 1/4	1	1	2	42	ABOCABRA
12		325	20	3	–	1	1	2	44	ABOCABLING
2C	(2)	155	25	4	2	1 1/2	1 1/2	–	52	ABOCALYX
2RC	(2)	120	20	4	2	1 1/2	1 1/2	2 1/2	54	ABOCASTER
12C		120	20	4	—	1 1/2	1 1/2	2 1/2	56	ABOCAXTON
1	(2)	400	35	4	2	2	2	–	58	ABOCENTRIC
1R	(2)	230	30	4	2	2	2	2 1/2	60	ABOCERVIX
11		230	30	4	—	2	2	2 1/2	60	ABOCEVIER
15	(2)	260	35	4	2	2 1/4	2 1/4	–	65	ABOCEDILLA
15R	(2)	180	30	4	2	2 1/4	2 1/4	3	68	ABOCEFFRON
15T		180	30	4	–	2 1/4	2 1/4	3	68	ABOCELFRY
1C	(2)	110	35	5	3	2 1/2	2 1/2	–	75	ABOCERFAL
1RC	(2)	65	30	5	3	2 1/2	2 1/2	4	78	ABOCIMITAR
11C		58	30	5	–	2 1/2	2 1/2	4	78	ABOCIVIC
15C	(2)	80	35	5	3			–	83	ABOCIBALD
15RC	(2)	52	30	5	3		‡	4	97	ABOCIRCUM
15TC		50	30	5				4	97	ABOCIGRAND

"LITTLE GIANT" CLOSE QUARTERS AIR DRILLS

‖†§ Size No		Speed Light, r p m	Air Used¶ per Min cu ft		Capacity° Drill in	Capacity° Ream	Capacity° Tap	Capacity° Flue Roll	Weight Net lb	Code
81	(3)	310	25	3	1 1/4	1		-	34	ABORIDEX
91	(3)	180	35	4	2	1 3/4	-	-	38	ABORIKON
81R	(3)	240	25		1 1/4	1	-	-	36	ABORIDEXTER
91R	(3)	120	35	4	2	1 3/4	—	-	40	ABORIKONISM
3		400	20	2	7/8	5/8		-	20	ABOREZOR

"LITTLE GIANT" WOOD BORING MACHINES

‖†§ Size No		Speed Light, r p m	Air Used¶ per Min cu ft		Capacity° Drill in	Capacity° Ream	Capacity° Tap	Capacity° Flue Roll	Weight Net lb	Code
10S	(4)	1000	7		3/4	—	—	—	8	ABORCATE
3RS	(4)	1200	15		1	-	—	—	14 1/2	ABOREXIS
3RSS	(4)	600	15		1	-	-	—	14 1/2	AZAGAYE
5	(5)	650	18		2	—	-	-	24	ABOREGON
5S	(5)	370	18		2 1/2	—	—	—	24	ABORELLO
14	(5)	700	20		4	—	—	—	32	ABORIMLET
14S	(5)	325	20		4 1/2	—	—	—	32	ABOROMA

*Nos 00 and 0 indicate chuck sizes; other numbers indicate Morse taper sockets.

†Nos in parentheses indicate the following regular equipment: (1) Breast plate and No 0 chuck (2) Feed screw. (3) Ratchet wrench for feed screw. (4) Grip handle and wood bit chuck. (5) Wood bit chuck.

‡Adapted for special extra heavy reaming and tapping

§Letter "R" indicates reversible type drills; letter "C" indicates compound geared drills; letter "T" indicates drills fitted with grip handles and especially adapted for tapping or flue rolling.

°Drilling capacities are for drilling in metal except wood boring machines, for which capacity in soft dry pine is given

‖Nos. 10-F to 3-A inclusive, and No. 8 have 1/4-in. hose connections; Nos. 4 to 91-R inclusive have 1/2-in. hose connections.

¶At 80 lb. pressure.

Continued on Next Page

"LITTLE GIANT" WOOD BORING MACHINES

NO 5 "LITTLE GIANT" WOOD BORING MACHINE

By gearing up "Little Giant" air drills to the proper speed, fitting them with suitable chucks and grip handles which control the reversing mechanism, a complete line of wood boring machines is available in capacities up to 4 in. in pine. They embody minimum weight in a reversible machine which will handle standard wood boring bits. May be reversed instantly and withdrawn while running at full speed. Also used for screwing in and tightening nuts and bolts. "Little Giant" wood boring machines prove useful wherever compressed air and wood boring exist together. Ask for Bulletin 598.

"LITTLE GIANT" PNEUMATIC GRINDERS

"Little Giant" grinders are adaptations of the smaller sizes of "Little Giant" air drills. Grinding wheel is mounted on extension of crankshaft. Four sizes. Ask for Bulletin 598.

NO. 3 "LITTLE GIANT" GRINDER

For general grinding and heavy work Air enters handle Trigger in grip handle, relieves operator and makes the grinder easy to handle

"LITTLE GIANT" AIR MOTORS, WINCHES AND GEARED HOISTS

SIZE NO. 12 "LITTLE GIANT" TWO-STRAND, THREE-TON PORTABLE GEARED AIR HOIST

Showing limit stop and chain control.

All "Little Giant" air winches and hoists are operated by a simple and reliable air motor. This motor has two double acting oscillating cylinders. Oscillation of cylinders opens and closes the ports—no other valve gear is necessary. Great power is obtained through a high speed motor 240 to 1100 r.p.m. Motor is reversible, easily controlled, has automatic lubrication and is of very rugged construction throughout.

Pneumatic Portable Geared Hoists—Made in capacities from 1 to 10 tons. Motor is controlled by chains from floor, or by remote control as desired. Safety is assured by an automatic air brake which holds the load at any desired point. A simple limit stop provides absolute protection against overhoisting. When desired, these hoists will be furnished with plain single track trolley, geared single or geared double track trolley. For full details ask for Bulletin 599.

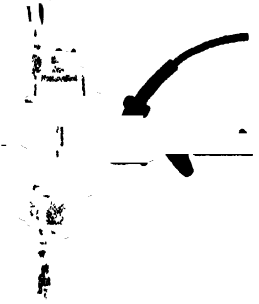
"LITTLE GIANT" PORTABLE GEARED AIR HOISTS

Size	Capacity (Tons)	Height of Lift	Lifting Speed (per Min.)	Min Distance Between Hooks	Air Consumption Per Ft. Lift	Net Weight	Code
		ft.	ft.	in.	cu ft	lb	
10	1	9	28	39	3	355	ACCRESCENT
11	2	9	16	39	4	360	ACCRETION
12	3	11	10	45	8	465	ACCROACH
13	5	12	7	53½	15	820	ACCROIRE
14	10	12	4	61½	27	1080	ACCRUE

NOTE. When desired, "Little Giant" portable geared hoists can be supplied in any of the above sizes, except size 10, equipped with either a plain trolley, geared single track trolley, or a geared double track trolley. When ordering, always state size and weight of channels on which trolley must operate.

"LITTLE GIANT" PORTABLE ELECTRIC DRILLS

Built with direct, alternating or "Universal" current motors in several sizes and types. Have ball bearings, stub tooth gears, ample ventilating and cooling systems, and high overload capacity without undue temperature rise. Controlled by patented nonarcing handle switch.



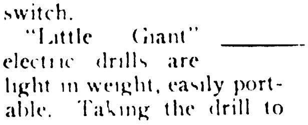
"LITTLE GIANT" PORTABLE ELECTRIC DRILL, UNIVERSAL TYPE

"Little Giant" electric drills are light in weight, easily portable. Taking the drill to the work saves carrying parts to drill presses, saves setting-up time, and expensive machine tool operations. Universally used in machine shops, garages, and also in largest manufacturing operations. Thousands are profitably used in the Ford Plants, where scientific minimum cost production is most highly developed. Frequently a small investment in "Little Giants" will produce a material increase in output per day. D. C. type drills are described in Bulletin 581; and "Universal" types in Bulletin 616.

These tools are built also in semi-portable type for drilling and reaming track joint holes. Such outfits, now in wide use by electric and steam railways, are 10 to 12 faster and 90 per cent cheaper than old-time hand methods. Ask for Bulletin E-60.

"LITTLE GIANT" ELECTRIC GRINDERS

Same general construction as "Little Giant" electric drills, but fitted with arbors for carrying abrasive wheels. Built in portable, tool-post and precision-grinding types. Foundries, machine shops, railways and metal manufacturing plants can use these tools for many labor-conserving purposes. Ask for Bulletin E-61.



NO. 8 BP "LITTLE GIANT" D. C. ELECTRIC PORTABLE GRINDER

"LITTLE GIANT" ELECTRIC DRILLS—DRILLING CAPACITIES IN METAL

Size	*Universal for 110 and 220 Volt	D C. for 120 and 240 Volt	**A C for 2 Phase and 3 Phase	D.C for Street Ry. Work, 600 Volt
	in.	in.	in.	in.
000	3/16	—	—	—
000x	¼	—	—	—
00 B	5/16	—	—	—
0 B	⅜	⅜	⅜	—
1B	½	½	½	½
1½ B	¾	¾	¾	⅝
2B	⅞	⅞	⅞	¾
3B	1¼	1¼	1¼	1
4B	—	2	2	1½

*For connection to ordinary lamp socket D C or A C of 60 cycles or less, single-phase, interchangeably.

**Furnished in side spindle style only Standard windings are for 60 cycles, 120 or 240 volts. Nos. 2, 3 and 4 can be wound for 380 or 440 volts.

NOTE In ordering specify Size No ; also whether D.C, A.C. or "Universal" type is desired. (If A.C., specify phase.)

L. R. CHRISTIE COMPANY

Manufacturers of

Dryers, Calciners, Roasters and Coolers

501 Peoples Bank Building

PITTSBURGH, PA.

PRODUCTS

Rotary Dryers, Calciners, Roasters and Coolers.

Also manufacturers of Rotary Continuous Retorts.

CHRISTIE

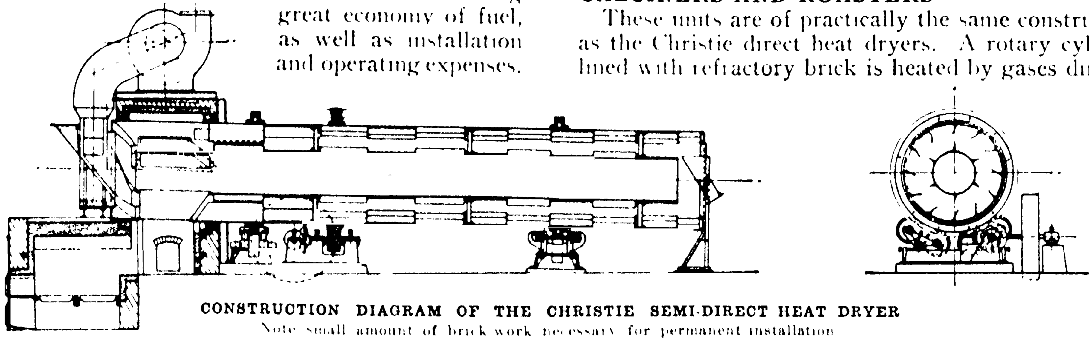
DRYERS · CALCINERS · COOLERS

TYPES OF DRYERS

The **L. R. Christie Company** manufactures every type of rotary dryer. Certain types have been improved and perfected to the very highest degree of efficiency. Chief among these are the semi-direct heat dryer, the indirect heat dryer, the indirect steam heat dryer and the direct heat dryer.

SEMI-DIRECT HEAT DRYER

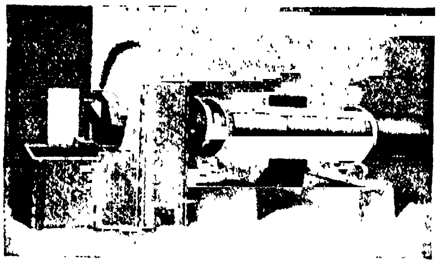
An internal heat flue type having a central flue through which the gases first pass, giving up their heat to the surrounding material and later passing directly through material in counter direction, effecting great economy of fuel, as well as installation and operating expenses.



CONSTRUCTION DIAGRAM OF THE CHRISTIE SEMI-DIRECT HEAT DRYER

Note small amount of brick work necessary for permanent installation

A continuous dryer perfected by Christie



SEMI-DIRECT HEAT DRYER

INDIRECT HEAT DRYER

In this dryer, the hot gases are not permitted to come in contact with the material. The heat is applied directly to the outer cylinder as it rotates and returns through a flue in center of drying compartment.

As all joints are closed, no dust collector is needed, even though materials are very finely divided.

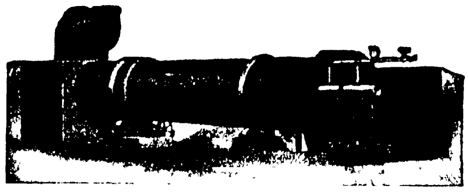
This dryer is substantially a rotary retort. Its true economy is evidenced by the remarkably low temperatures at exhaust.

DIRECT HEAT DRYER

A single shell, direct fired cylinder for rough work. Furnace at feed or discharge according to materials being dried.

STEAM HEATED DRYER

Frequently in drying certain materials a high temperature has been found injurious. To offset such a possibility and maintain an even low heat, steam may be used as a heat medium, applied either through an internal coil or by air heated in an external coil.



DRYER USING INDIRECT STEAM HEAT

CALCINERS AND ROASTERS

These units are of practically the same construction as the Christie direct heat dryers. A rotary cylinder lined with refractory brick is heated by gases directly applied to material. Exceedingly high temperatures are secured, moisture driven off, foreign matter burned out and chemical reactions obtained.

SERVICES

In order that the **L. R. Christie Company** may be of maximum service in the solution of drying problems, the following details should be kept in mind when writing for information:

- Character of material to be dried.
- Capacity in dry tons of 2000 lbs. per hour.
- Initial and final percentage of moisture. Is moisture free or combined? If combined, at what temperature is it driven off?
- Temperature which material will stand without injury.
- Fineness (mesh) of materials.
- Are materials injured by direct contact with furnace gases?
- Is waste heat available? Temperature. Quantity.
- Fuel to be used: coal, oil, gas or waste heat.

Twenty-one years of specialized effort in designing and operating drying and cooling machinery have been responsible for these advanced models. They are not untried experiments. Their marked economy, made possible through many improvements over old types of dryers, recommends them immediately to the discriminating buyer.

GEO. L. CLAFLIN COMPANY

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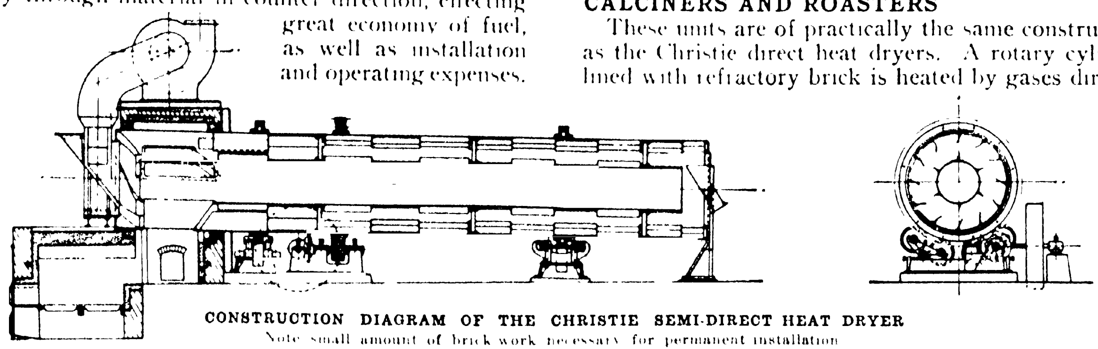

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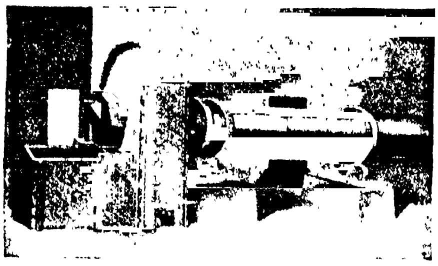

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ablished 1878

JAMES B. CLOW & SONS

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Our two plants shown below produce all sizes of cast ron pipe 1½ inch to 48 inch. They are also equipped o handle any type of casting required by the Chemcal trades

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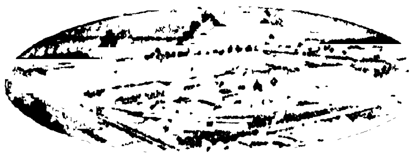
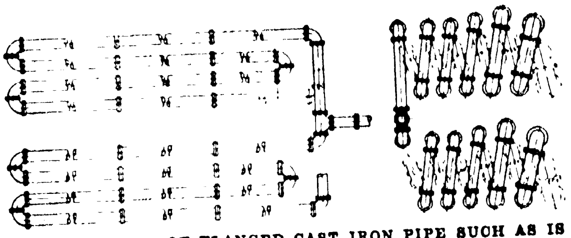


CLOW PLANT, NEWCOMERSTOWN, OHIO

SPECIAL CASTINGS

We are prepared to furnish special castings from your plans and specifications. Our Engineering Department will gladly assist you in designing if desired.

TYPICAL USES FOR CAST IRON PIPE



CONDENSER COIL OF FLANGED CAST IRON PIPE SUCH AS IS USED IN OIL REFINERIES

CAST IRON PIPE USED BY CALUMET AND HECLA MINING CO. TO CONVEY MILL TAILINGS

Wherever abrasive metals are to be conveyed—Cast Iron Pipe can be used

ILLUSTRATING USES OF CAST IRON PIPE IN BY-PRODUCT COKE OVEN INSTALLATION.

The piping in such installations is subject to corrosive action of gases and fumes and Cast Iron Pipe is used exclusively

OTHER USES OF CAST IRON PIPE

Wherever pipe or fittings are subject to corrosion, cast iron should be used. For handling gases, coal, tar, oils, naphtha, benzol, ammonia, sulphuric or other acid, fresh or salt water, cast iron is recommended.

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Complete Catalogs gladly sent on request. The following will aid in the selection of the catalog suited to the requirements:

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Heating, Special Catalog.
Cast Iron Pipe, Fittings and Foundry Products—Pipe Economy.
Steam and Water Works Supplies, Catalog "A."
Water Sterilization, R.U.V. Catalog.

L. R. CHRISTIE COMPANY

Manufacturers of

Dryers, Calciners, Roasters and Coolers

501 Peoples Bank Building

PITTSBURGH, PA.

CHRISTIE

DRYERS · CALCINERS · COOLERS

PRODUCTS

Rotary Dryers, Calciners, Roasters and Coolers.

Also manufacturers of Rotary Continuous Retorts.

TYPES OF DRYERS

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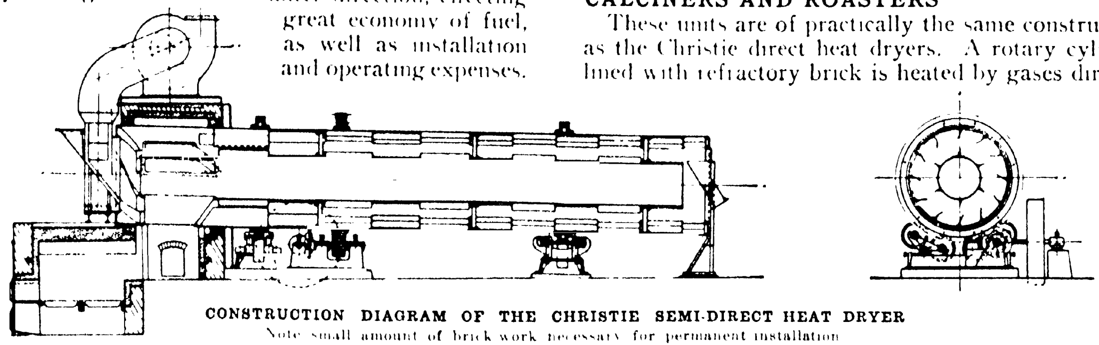
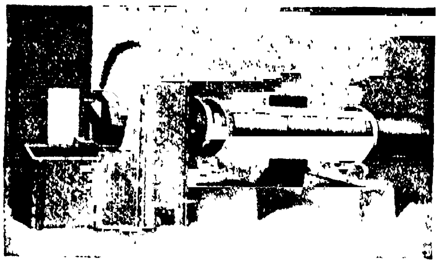
An internal heat flue type having a central flue through which the gases first pass, giving up their heat to the surrounding material and later passing directly through material in counter direction, effecting great economy of fuel, as well as installation and operating expenses.



CONSTRUCTION DIAGRAM OF THE CHRISTIE SEMI-DIRECT HEAT DRYER

Note small amount of brick work necessary for permanent installation

A continuous dryer perfected by Christie



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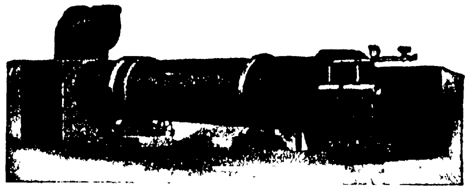

DRYER USING INDIRECT STEAM HEAT

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ablished 1878

JAMES B. CLOW & SONS

Manufacturers of Cast Iron Pipe, Plumbing and Heating Supplies,
Cast Iron Columns

Telephone
ABASH 2789

534-536 South Franklin Street
CHICAGO, ILL.

SALES OFFICES
w York N. Y
Louis, Mo
Milwaukee, Wis
Pittsburgh, Pa
Denver Colo
San Francisco Calif
Minneapolis Minn
Tampa Fla
Omaha Nebr
Detroit Mich
Philadelphia Pa
Kansas City Mo

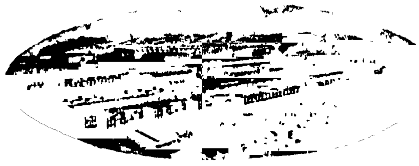
WORKS
Chicago Ill
Newcomerstown, Ohio
Coshocton, Ohio

RODUCTS

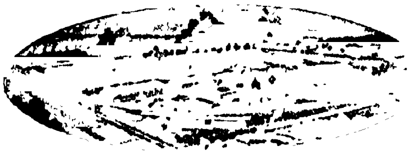
Cast Iron Pipe and Fittings—Hub and Spigot, anged or threaded joints.
Special Castings for Chemical Companies.
Plumbing and Heating Supplies.
Water Works and Steam Supplies.
Marble Products.
Ultraviolet Ray Sterilizers.
"Gasteam" Radiators.

ACILITIES

Our two plants shown below produce all sizes of cast ron pipe 1½ inch to 48 inch. They are also equipped o handle any type of casting required by the Chemical trades



CLOW PLANT, COSHOCTON, OHIO

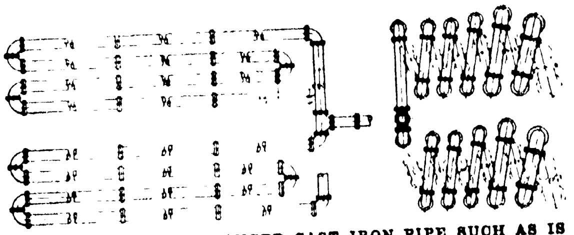


CLOW PLANT, NEWCOMERSTOWN, OHIO

SPECIAL CASTINGS

We are prepared to furnish special castings from your plans and specifications. Our Engineering Department will gladly assist you in designing if desired.

TYPICAL USES FOR CAST IRON PIPE



CONDENSER COIL OF FLANGED CAST IRON PIPE SUCH AS IS USED IN OIL REFINERIES

CAST IRON PIPE USED BY CALUMET AND HECLA MINING CO. TO CONVEY MILL TAILINGS

Wherever abrasive metals are to be conveyed—Cast Iron Pipe can be used

ILLUSTRATING USES OF CAST IRON PIPE IN BY-PRODUCT COKE OVEN INSTALLATION.

The piping in such installations is subject to corrosive action of gases and fumes and Cast Iron Pipe is used exclusively

OTHER USES OF CAST IRON PIPE

Wherever pipe or fittings are subject to corrosion, cast iron should be used. For handling gases, coal, tar, oils, naphtha, benzol, ammonia, sulphuric or other acid, fresh or salt water, cast iron is recommended.

CATALOGS

Complete Catalogs gladly sent on request. The following will aid in the selection of the catalog suited to the requirements:

Plumbing, Catalog "M."
Drinking Fountains, Fountain Catalog.
Heating, Special Catalog.
Cast Iron Pipe, Fittings and Foundry Products—Pipe Economy.
Steam and Water Works Supplies, Catalog "A."
Water Sterilization, R.U.V. Catalog.

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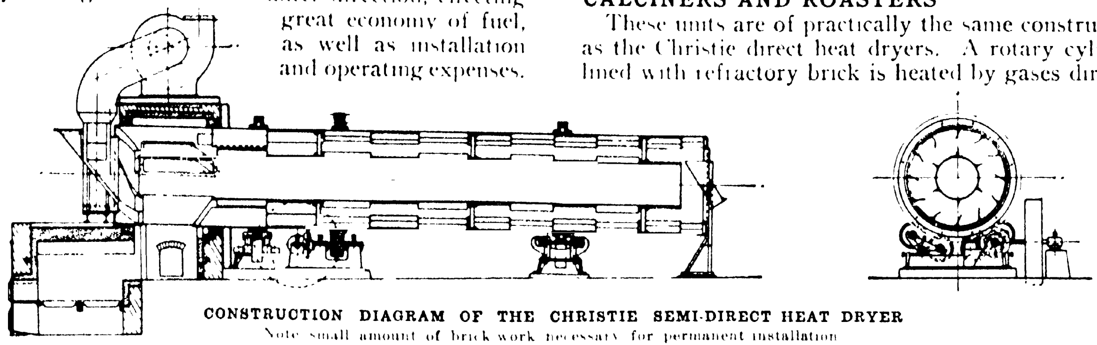

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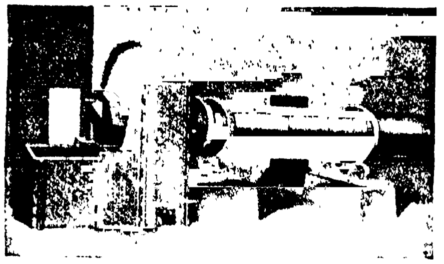

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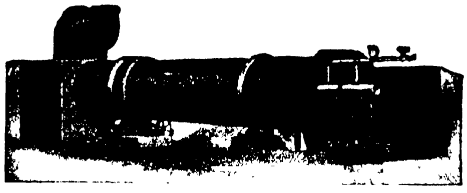

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CONSOLIDATED PRODUCTS COMPANY

INCORPORATED

Cable Address
"EQUIPMENT", New York
Telephone
CORTLANDT 7506 7507
WAREHOUSE
Jersey City, N. J.

Machinery, Tanks, Equipment

38 PARK ROW, NEW YORK, N. Y.

PRODUCTS

- Autoclaves
- Acid Eggs
- Boilers
- Blowers
- Centrifugals
- Compressors
- Condensers
- Crushers
- Shelf Dryers
- Drum Dryers
- Rotary Dryers
- Steam Engines
- Gas and Oil Engines
- Evaporators
- Filter Presses
- Generators
- Grinders
- Kettles
- Motors
- Mills
- Mixers
- Machine Tools
- Nitrators
- Pumps
- Pans
- Stills
- Stacks
- Sulphonators
- Sulphur Burners
- Tanks

SERVICE

Our service in furnishing good new and used equipment is being used by many large concerns.

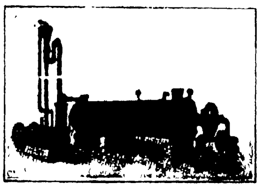
You can depend on our specifications and the excellent working condition of our equipment.

Our stock consists of a large number of standard equipments, and we are able to make immediate shipment.

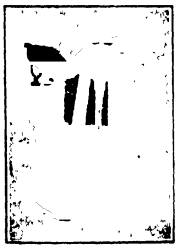
You can make a considerable saving by purchasing from us. We are always in the market for equipment, and are interested in any idle equipment you may have. You will be interested in our engineering service applied to used equipment. It will save your time.

Your inquiries are solicited.

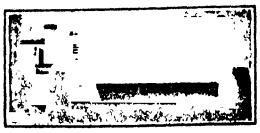
EQUIPMENT


ROTARY DRYER

For their various particular purposes we have atmospheric and vacuum rotary drum dryers, rotary vacuum dryers, and direct and indirect fire rotary dryers.

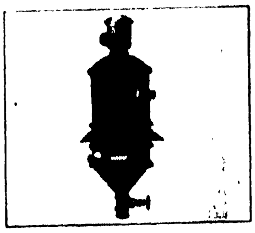

CENTRIFUGAL

Centrifugal machines embrace both overdriven and underdriven types, bottom and top discharge, furnished with steel, copper, bronze, or rubberized baskets.

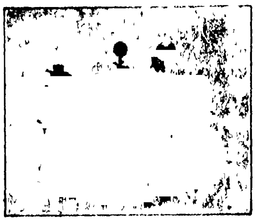

GRINDER

Grinding and crushing machinery of all types, tube, ball, and attrition mills, crushers and energy ring roll mills, disintegrators, burr stone mills, roller mills, etc.

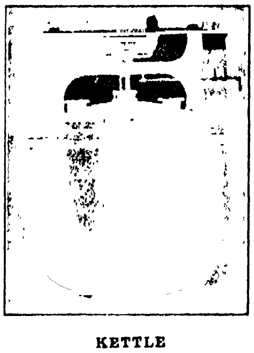
Evaporators are furnished in various types, both single and multiple effect. The construction is of cast iron, steel, copper or bronze according to requirements.


EVAPORATOR

Shelf Dryers of both vacuum and atmospheric types in various sizes. Also truck type dryers. Capacities range from laboratory sizes to the largest standard type made.


SHELF DRYER

Kettles, both plain and jacketed, for various purposes, such as reducing, nitrating, sulphonating, boiling, distilling, mixing. The construction being in accordance with the requirements.


KETTLE
Nitrator or Sulphonator

Filters in plate and frame, clam shell, rotary, and tank types in various sizes.

FILTER PRESS

Tanks of both steel and wood up to 55,000 barrels.

TANK

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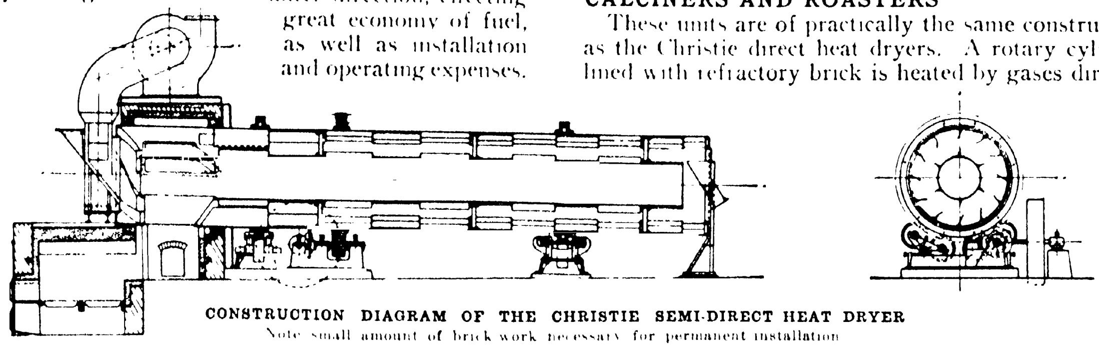

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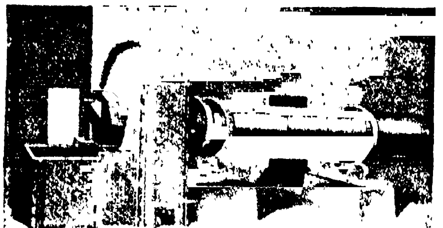

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THE COOLING TOWER COMPANY, INC.

Cable Address
"COOLTOWCO"
W U Code

Specialists in Atmospheric Cooling

15 JOHN STREET, NEW YORK, N. Y.

TERRITORIAL AGENTS

Atlanta, Ga., McKee & Wright Co., 258 Candler Annex
Baltimore, Md., Central Construction & Supply Co., 9 West Redwood St
Boston, Mass., Starkweather & Broadhurst, Inc., 79 Milk St
Birmingham, Ala., Feaster's Sales Co., Inc., 1311 Fourth Ave., W. F.
Cincinnati, O., C. M. Robinson Co., 16 West 12th St
Cleveland, O., York Ohio Ice Machine Co., 1106 Woodland Ave
Detroit, Mich., The Coon DeVisser Co., 1772 West Lafayette Blvd
Fort Worth, Texas, Texas Manufacturing Co
Greenville, S. C., G. G. Slaughter Machinery Co
Houston, Texas, Rossiter & Saner, 410 Union Nat'l Bank Bldg
Los Angeles, Cal., Pacific Sales Agency, 585 S. Rita Ave
New York City, Lasker & Minck, 220 Broadway
Philadelphia, Pa., Central Construction & Supply Co., 2224 Arch St.
Pittsburgh, Pa., Wilhelm Griesser, 213 First Ave
St. Louis, Mo., Hablutzel & Smith Heating Co., 3166 South Grand Ave
San Francisco, Cal., H. F. Watkins Company, Hansford Bldg
Savannah, Ga., H. K. Painter Engineering Co., 14 West President St
Shreveport, La., The Sullivan Co., 110 Kittrell Bldg
Cuba, Havana, Victor G. Mendoza Co., Cuba No. 3
India, Calcutta, British American Machinery Co., Ltd
Kansas City, Mo., The Rawlings Industrial Equipment Co., Grand Avenue Temple Bldg

PRODUCTS

All forms of atmospheric cooling apparatus, including atmospheric, mechanical draught and chimney cooling towers: from six gallons per minute capacity up; spray nozzle water cooling systems in any capacity. Spray nozzles for washing, scrubbing or cooling gases; where necessary of special material for handling acids. Air Washers.

GENERAL

Our Cooling Apparatus is designed for hard, continuous and uninterrupted service with three principal objectives.

1. Maximum thermal efficiency—the attainment in a given climate of the lowest practicable temperature and greatest range of cooling.
2. Minimum maintenance expense—lowest repair bills, upkeep charges and depreciation.
3. Minimum operating expense—lowest labor and power charges. Also the lowest collateral losses chargeable to apparatus due to interrupted service from breakdowns, plugging and other causes of stoppage.

That our apparatus has successfully met the issues created by the diverse problems of our numerous clients is proved by repeat orders which constitute over fifty per cent. of our total business. We are proud of the fact that every installation we have made has been a success and it is a pleasure to refer to any and all of our customers.

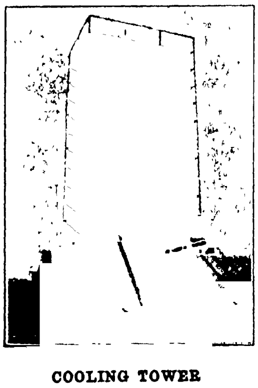
COOLING TOWERS

Our towers operate on the weir system rather than the perforated pan or saw tooth principle, with the result that we have the greatest possible freedom from stoppage or plugging, which causes inefficiency and loss of time during a hot spell. Owing to our long experience in building cooling towers we are in a position to supply them under a definite guarantee.

Our standard towers are composite structures of steel and wood, but where acid-resisting qualities are required we build an all wood tower containing no metal whatever.

Our towers are built on the multiple unit system so they can be added to as the plant grows without affecting either their efficiency or appearance.

For complete description send for Catalog 9A.



COOLING TOWER
100 Gallons per Minute

IMPACT SPRAY NOZZLES

Are the latest development in Spray Nozzle design to meet the requirements of water-cooling service. Perfect comminution by the jets with uniform and large distribution is effected at low pumping expense. The water passages, as will be noted from the cut, are devoid of obstructions and intricacy, thus avoiding loss due to eddying and accumulation of foreign matter with consequent plugging.

See Catalog 9A.

IMPACT
SPRAY NOZZLE

NOZZLE SPECIFICATION

Pressure in Pounds per Square Inch — Capacity in U. S. Gallons per Minute

	Thread for Pipe Connection	5	6	7	8	9	10	12	15	20	25	30	40	50
60	2"	53	58	62.5	67	71	74.5	82	92	106	118	130	150	167
50	2"	44	48	52	55.5	59	62	68	76	88	98	107	124	138
45	2"	40	43.5	47	50	53	56	61	69	79	88.5	97	112	125
40	2"	35.4	38.8	42	45	47.5	50	55	61	71	79	87	100	112
35	2"	30.8	33.8	36.4	39	41.2	43.5	48	53.5	61	68	75	87	97
30	1½"	26.2	28.6	31	33	35	37	40.5	45.5	52	58.5	64	74	82.6
25	1½"	22	24	26	27.8	29.4	31	34	38	43.8	49	54	62	69
20	1½"	17.5	19.4	20.8	22.2	23.5	24.8	26	30.5	35	39	43	49.5	55.5
15	1½"	13	14.3	15.5	16.5	17.5	18.5	20.2	22.6	26	29	32	37	41.6
10	1½"	8.7	9.6	10.4	11.1	11.7	12.4	13.5	15.2	17.5	19.5	21.5	24.8	27.8
8	1"	7	7.7	8.3	8.9	9.4	9.9	10.8	12.1	14	15.6	17	19.7	22
5	1"	4.4	4.8	5.2	5.5	5.9	6.2	6.8	7.6	8.8	9.8	10.8	12.4	13.8

Above sizes carried in stock

TOWER FORMULA:

To see what tower will do for you, use this formula

$$T_1 = \frac{t + 2t_1 + T}{4}$$

t = Temperature of dry bulb, or air

t_1 = Temperature of wet bulb

T = Temperature of water to tower or nozzles

T_1 = Temperature of water from tower or nozzles

$$t_2 = \frac{4t_1 + t}{5}$$

TOWER DIMENSIONS, ETC.

Capacity gals per Minute	Dimensions in Feet		Piping in Inches		Wt Complete Lbs
	Footings	Over All	Supply	Discharge	
25	4x 4	7x 7x15	1½	2	2800
50	4x 8	7x11x15	2	2½	4600
75	6x 9	11x14x20	2½	3	9600
100	6x12	11x17x20	3	3½	11400
125	6x15	11x20x20	3½	4	13000
150	6x18	11x23x20	3½	4	14800
175	6x21	11x26x20	4	4½	16000
200	12x12	19x19x30	4	5	22000
300	12x18	19x25x30	4½	6	28300
400	12x24	19x31x30	5	6	34000
500	12x30	19x37x30	6	7	40000
600	12x35	19x42x30	7	8	45500
700	12x41	19x4[illegible]x30	7	8	51500
800	12x47	19x54x30	8	10	57000
900	12x53	19x60x30	8	10	62900
1000	12x59	19x66x30	10	12	68200

c = A constant which varies from 4 to 6 depending on the capacity of nozzle and arrangement specified and is based on performance with average wind velocity of 5 miles per hour. Our guarantee is based on a value of "c" to suit specified conditions.

COOLING FORMULA FOR IMPACT SPRAY NOZZLE

$$T_1 = T - \left[\frac{\left\{ \frac{(T + 460) + (t_2 + 460)}{2} \right\}^4 - \left\{ t_2 + 460 \right\}^4}{C \times 100{,}000{,}000} \right]$$

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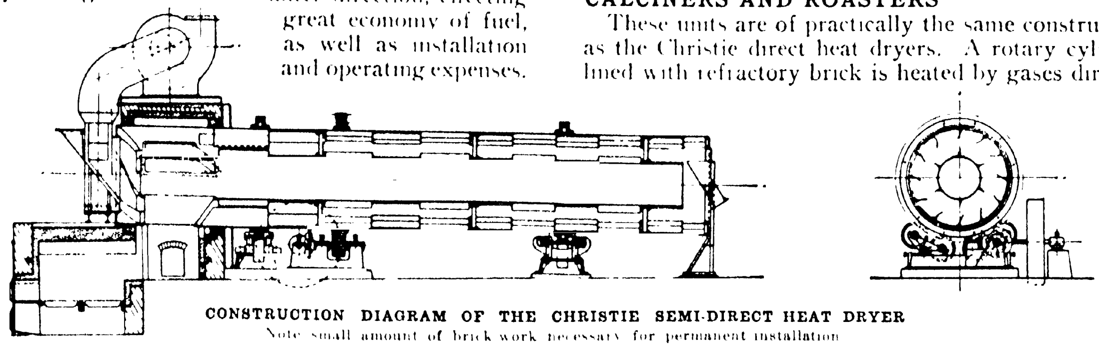
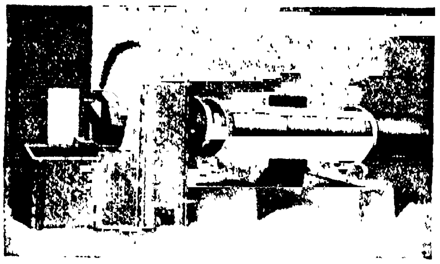


CONSTRUCTION DIAGRAM OF THE CHRISTIE SEMI-DIRECT HEAT DRYER

Note small amount of brick work necessary for permanent installation

A continuous dryer perfected by Christie



SEMI-DIRECT HEAT DRYER

INDIRECT HEAT DRYER

In this dryer, the hot gases are not permitted to come in contact with the material. The heat is applied directly to the outer cylinder as it rotates and returns through a flue in center of drying compartment.

As all joints are closed, no dust collector is needed, even though materials are very finely divided.

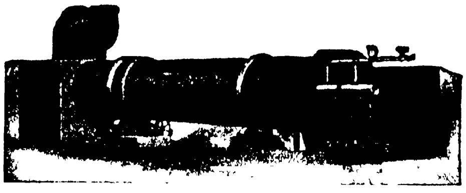
This dryer is substantially a rotary retort. Its true economy is evidenced by the remarkably low temperatures at exhaust.

DIRECT HEAT DRYER

A single shell, direct fired cylinder for rough work. Furnace at feed or discharge according to materials being dried.

STEAM HEATED DRYER

Frequently in drying certain materials a high temperature has been found injurious. To offset such a possibility and maintain an even low heat, steam may be used as a heat medium, applied either through an internal coil or by air heated in an external coil.



DRYER USING INDIRECT STEAM HEAT

CALCINERS AND ROASTERS

These units are of practically the same construction as the Christie direct heat dryers. A rotary cylinder lined with refractory brick is heated by gases directly applied to material. Exceedingly high temperatures are secured, moisture driven off, foreign matter burned out and chemical reactions obtained.

SERVICES

In order that the **L. R. Christie Company** may be of maximum service in the solution of drying problems, the following details should be kept in mind when writing for information:

- Character of material to be dried.
- Capacity in dry tons of 2000 lbs. per hour.
- Initial and final percentage of moisture. Is moisture free or combined? If combined, at what temperature is it driven off?
- Temperature which material will stand without injury.
- Fineness (mesh) of materials.
- Are materials injured by direct contact with furnace gases?
- Is waste heat available? Temperature. Quantity.
- Fuel to be used: coal, oil, gas or waste heat.

Twenty-one years of specialized effort in designing and operating drying and cooling machinery have been responsible for these advanced models. They are not untried experiments. Their marked economy, made possible through many improvements over old types of dryers, recommends them immediately to the discriminating buyer.

Crucibles, Gooch

With perforated bottom; glazed throughout except outside bottom surface.

Size number	2	2a	3	4
Diameter rim mm	27	33	35	40
Diameter bottom mm	18	20	22	25
Height mm	30	33	40	43
Diameter perforations, mm.	1	1	1	1
Capacity, cc	10	20	25	35

Crucible Covers

For high form crucibles, glazed throughout

Size number	000	00	0	1	1a	2	3	4	5
Diameter, mm	32	35	42	47	56	59	71	81	95

Discs, Perforated

For Caldwell crucibles and for funnels; glazed on top surface.

Sizes 4 to 9 inclusive, with 60° beveled edge

Size number	0	1	2	3	4	5
Diameter mm	15	18	20	22	25	30
Thickness, mm	2	2	2	2	3.5	4
Diameter perforations, mm.	1	1	1	1	1	1
Size number	6	7	8	9	10	11
Diameter, mm	38	50	60	75	100	150
Thickness, mm	4	4	4	4	6	6
Diameter perforations, mm	1	1	1	1	1	1

Dishes, Evaporating

With lip; Nos. 000 to 4 glazed throughout except rim; Nos. 5 to 13 glazed inside and half-way down outside.

Size number	000	00	0	1	2	3	4	5	6
Diameter, mm	60	70	80	85	90	100	110	120	145
Height, mm	24	27	30	33	37	42	44	50	48
Capacity, cc..	35	60	80	100	140	175	210	300	385
Size number	6a	7	8	8a	9	10	11	12	13
Diameter, mm	162	185	215	230	265	305	360	400	460
Height, mm	51	54	63	70	80	95	116	140	175
Capacity, cc ..	535	765	1285	1430	2200	3250	5700	10000	16500

Dishes, Evaporating

With wide lip and heavy welter rim; glazed inside and half-way down outside.

Size number	12	13
Diameter, mm	400	460
Height, mm	140	175
Capacity, cc	10000	16500

Dye Pots, See Beakers

Filter Cones

Glazed throughout except rim.

Size number	3	4
Diameter, mm	50	63
Height, mm	43	62
Diameter holes, mm	1.5	1.5

Funnels, Buchner

With fixed perforated plate; glazed throughout except rim.

Size number	0	1	2	2a	3	4	4a	5
Outside diameter, mm	48	66	82	102	122	138	163	200
Inside diameter mm	42	60	75	95	115	130	155	190
Diameter perforated area, mm	28	45	60	80	100	115	140	175
Distance, rim to perforated plate, mm	17	27	37	46	57	61	66	75
Height over all, mm	76	100	140	165	195	215	234	280
Length of tube, mm	46	50	70	80	90	100	110	130
Diameter of tube, mm	11	8	9	12	14	16	18	20

Funnels, Hirsch

With fixed perforated plate; glazed throughout except rim.

Size number	.0000	000	00	0	1	2	3	4
Diameter top mm	54	50	75	92	103	120	140	163
Diameter perforated area, mm	16	28	28	28	28	45	45	60
Distance, rim to perforated plate, mm...	26	12	18	33	41	45	62	69
Height over all, mm .	66	61	95	121	131	158	185	217
Length of tube, mm ..	84	30	41	52	56	68	79	93
Diameter of tube, mm	12	10	10	12	14	15	16	17

Mortars with Pestles

With lip; glazed outside; Pestles glazed to grinding surface.

Size number	0	1	2	3	4	5
Diameter, mm	70	90	115	130	160	210
Height, mm	42	58	70	80	100	130
Capacity, cc	60	135	275	400	750	1900
Length of pestle, mm	110	135	170	190	240	240

Plates, Color

Glazed throughout except bottom surface.

Size number	1	2	3	4
Length, mm	110	160	180	180
Width, mm	90	125	110	140
Thickness, mm	7	10	10	10
Number of depressions	12	12	24	30
Diameter of depressions mm	20	30	20	20
Depth of depressions mm	5	5	5	5

Plates Desiccator

On three small feet; glazed on top.

Size number	0	1	2	2a	2b	3	4	5
Diameter mm	85	95	115	120	125	140	190	230
Thickness, mm	4	4	4	4	4	5	5	5
Number of holes	3	3	4	5	8	5	7	8
Diam of holes	23	30	30	23	23	30	30	30

Plates, Streak

Unglazed.

Size number	1	2	3	4	5	6
Length, mm	65	70	85	90	100	140
Width, mm	50	40	60	65	60	90
Thickness mm	3	3	4	4	4	4

Spatulas

Long Spatula on one end, knob on the other; glazed throughout.

Size number	1	2	3	4	5	5a	6
Length, mm	115	155	200	275	310	345	442

Spatulas

Spatula on both ends; glazed throughout.

Size number	1	2	3	4	5	5a	6	7
Length, mm	105	120	150	195	212	225	280	348

Spatulas

Spatula on one end, spoon on the other; glazed throughout.

Size number	1	1a	2	3	4	4a	5	6
Length, mm	96	120	140	160	190	203	247	400

Tubes, Pyrometer

Glazed outside only. Furnished glazed throughout on special order.

Size number	0	1	2	3	4	5	5a	6	7
Outside diameter, mm	10	12.5	14	17	20	28	30	38	60
Inside diameter, mm	6	10.5	10	12	15	20	25	28	48
Length, mm.	1000	1000	1000	1000	1000	1000	1000	1000	1000

Porous Cells, Rectangular

Size number	0	1	2	3
Length, mm	70	195	305	340
Width, mm	20	50	63	195
Height, mm	90	170	305	335

Porous Cups, Cylindrical

Size number	1	2	2a	3	4	5	5a	6	7
Diameter, mm	25	30	38	25	40	52	50	65	76
Height, mm	76	76	75	102	90	100	126	150	127
Size number	8	8a	9	10	11	12	13	14	15
Diameter, mm	76	80	88	90	100	150	178	133	200
Height, mm	177	200	265	210	280	250	228	305	510

In addition to the above Porcelain Apparatus and Utensils, we manufacture Porcelain Acid Receivers, Ball Mills, Bottle Rests, Combustion Capsules, Graduated Pitchers, Glazed Plates, Mercury Troughs, Swimming Cups, Centrifuge Baskets, Bunsen Burners, Delivery Tubes, Combustion Tubes, Porous Filters, etc.

STOCKS

Coors Porcelain is carried in stock by the leading dealers in laboratory supplies throughout the United States and Canada. Should your dealer be temporarily unable to supply your needs, notify us and we will see to it that you are promptly supplied.

We maintain a sufficient stock at our plant to promptly fill orders from dealers.

SERVICE

We are at all times prepared to undertake the production of special forms of porcelain apparatus in quantity.

INFORMATION

Write us for catalog and samples, which will be cheerfully furnished, and we will advise you of the nearest source of supply.

L. R. CHRISTIE COMPANY

Manufacturers of

Dryers, Calciners, Roasters and Coolers

501 Peoples Bank Building

PITTSBURGH, PA.

PRODUCTS

Rotary Dryers, Calciners, Roasters and Coolers.

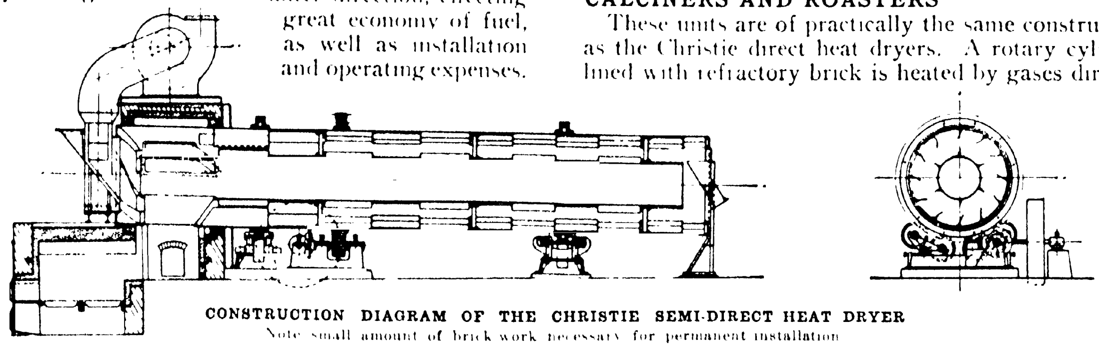
Also manufacturers of Rotary Continuous Retorts.

TYPES OF DRYERS

The **L. R. Christie Company** manufactures every type of rotary dryer. Certain types have been improved and perfected to the very highest degree of efficiency. Chief among these are the semi-direct heat dryer, the indirect heat dryer, the indirect steam heat dryer and the direct heat dryer.

SEMI-DIRECT HEAT DRYER

An internal heat flue type having a central flue through which the gases first pass, giving up their heat to the surrounding material and later passing directly through material in counter direction, effecting great economy of fuel, as well as installation and operating expenses.



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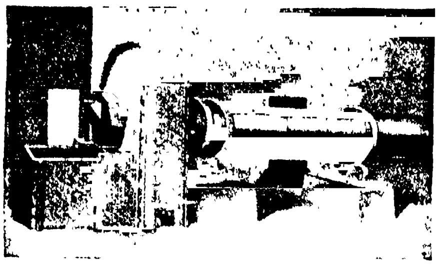

SEMI-DIRECT HEAT DRYER

INDIRECT HEAT DRYER

In this dryer, the hot gases are not permitted to come in contact with the material. The heat is applied directly to the outer cylinder as it rotates and returns through a flue in center of drying compartment.

As all joints are closed, no dust collector is needed, even though materials are very finely divided.

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A single shell, direct fired cylinder for rough work. Furnace at feed or discharge according to materials being dried.

CHRISTIE

DRYERS · CALCINERS · COOLERS

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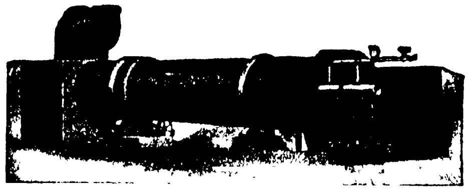
Frequently in drying certain materials a high temperature has been found injurious. To offset such a possibility and maintain an even low heat, steam may be used as a heat medium, applied either through an internal coil or by air heated in an external coil.



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Crucibles, Gooch

With perforated bottom; glazed throughout except outside bottom surface.

Size number	2	2a	3	4
Diameter rim mm	27	33	35	40
Diameter bottom mm	18	20	22	25
Height mm	30	33	40	43
Diameter perforations, mm.	1	1	1	1
Capacity, cc	10	20	25	35

Crucible Covers

For high form crucibles, glazed throughout

Size number	000	00	0	1	1a	2	3	4	5
Diameter, mm	32	35	42	47	56	59	71	81	95

Discs, Perforated

For Caldwell crucibles and for funnels; glazed on top surface.

Sizes 4 to 9 inclusive, with 60° beveled edge

Size number	0	1	2	3	4	5
Diameter mm	15	18	20	22	25	30
Thickness, mm	2	2	2	2	3.5	4
Diameter perforations, mm.	1	1	1	1	1	1

Size number	6	7	8	9	10	11
Diameter, mm	38	50	60	75	100	150
Thickness, mm	4	4	4	4	6	6
Diameter perforations, mm	1	1	1	1	1	1

Dishes, Evaporating

With lip; Nos. 000 to 4 glazed throughout except rim; Nos. 5 to 13 glazed inside and half-way down outside.

Size number	000	00	0	1	2	3	4	5	6
Diameter, mm	60	70	80	85	90	100	110	120	145
Height, mm	24	27	30	33	37	42	44	50	48
Capacity, cc..	35	60	80	100	140	175	210	300	385

Size number	6a	7	8	8a	9	10	11	12	13
Diameter, mm	162	185	215	230	265	305	360	400	460
Height, mm	51	54	63	70	80	95	116	140	175
Capacity, cc ..	535	765	1285	1430	2200	3250	5700	10000	16500

Dishes, Evaporating

With wide lip and heavy welter rim; glazed inside and half-way down outside.

Size number	12	13
Diameter, mm	400	460
Height, mm	140	175
Capacity, cc	10000	16500

Dye Pots, See Beakers

Filter Cones

Glazed throughout except rim.

Size number	3	4
Diameter, mm	50	63
Height, mm	43	62
Diameter holes, mm	1.5	1.5

Funnels, Buchner

With fixed perforated plate; glazed throughout except rim.

Size number	0	1	2	2a	3	4	4a	5
Outside diameter, mm	48	66	82	102	122	138	163	200
Inside diameter mm	42	60	75	95	115	130	155	190
Diameter perforated area, mm	28	45	60	80	100	115	140	175
Distance, rim to perforated plate, mm	17	27	37	46	57	61	66	75
Height over all, mm	76	100	140	165	195	215	234	280
Length of tube, mm	46	50	70	80	90	100	110	130
Diameter of tube, mm	14	8	9	12	14	16	18	20

Funnels, Hirsch

With fixed perforated plate; glazed throughout except rim.

Size number	0000	000	00	0	1	2	3	4
Diameter top mm	54	50	75	92	103	120	140	163
Diameter perforated area, mm	16	28	28	28	28	45	45	60
Distance, rim to perforated plate, mm...	26	12	18	33	41	45	62	69
Height over all, mm	66	61	95	121	131	158	185	217
Length of tube, mm ..	84	30	41	52	56	68	79	93
Diameter of tube, mm	12	10	10	12	14	15	16	17

Mortars with Pestles

With lip; glazed outside; Pestles glazed to grinding surface.

Size number	0	1	2	3	4	5
Diameter, mm	70	90	115	130	160	210
Height, mm.	42	58	70	80	100	130
Capacity, cc	60	135	275	400	750	1900
Length of pestle, mm	110	135	170	190	240	240

Plates, Color

Glazed throughout except bottom surface.

Size number	1	2	3	4
Length, mm	110	160	180	180
Width, mm	90	125	110	140
Thickness, mm	7	10	10	10
Number of depressions	12	12	24	30
Diameter of depressions mm	20	30	20	20
Depth of depressions mm	5	5	5	5

Plates Desiccator

On three small feet; glazed on top.

Size number	0	1	2	2a	2b	3	4	5
Diameter mm	85	95	115	120	125	140	190	230
Thickness, mm	4	4	4	4	4	5	5	5
Number of holes	3	3	4	5	8	5	7	8
Diam of holes	23	30	30	23	23	30	30	30

Plates, Streak

Unglazed.

Size number	1	2	3	4	5	6
Length, mm	65	70	85	90	100	140
Width, mm	50	40	60	65	60	90
Thickness mm	3	3	4	4	4	4

Spatulas

Long Spatula on one end, knob on the other; glazed throughout.

Size number	1	2	3	4	5	5a	6
Length, mm	115	155	200	275	310	345	442

Spatulas

Spatula on both ends; glazed throughout.

Size number	1	2	3	4	5	5a	6	7
Length, mm	105	120	150	195	212	225	280	348

Spatulas

Spatula on one end, spoon on the other; glazed throughout.

Size number	1	1a	2	3	4	4a	5	6
Length, mm	96	120	140	160	190	203	247	400

Tubes, Pyrometer

Glazed outside only. Furnished glazed throughout on special order.

Size number	0	1	2	3	4	5	5a	6	7
Outside diameter, mm	10	12.5	14	17	20	28	30	38	60
Inside diameter, mm	6	10.5	10	12	15	20	25	28	48
Length, mm.	1000	1000	1000	1000	1000	1000	1000	1000	1000

Porous Cells, Rectangular

Size number	0	1	2	3
Length, mm	70	195	305	340
Width, mm	20	50	63	195
Height, mm	90	170	305	335

Porous Cups, Cylindrical

Size number	1	2	2a	3	4	5	5a	6	7
Diameter, mm	25	30	38	25	40	52	50	55	76
Height, mm	76	76	75	102	90	100	126	150	127

Size number	8	8a	9	10	11	12	13	14	15
Diameter, mm	76	80	88	90	100	150	178	133	200
Height, mm	177	200	265	210	280	250	228	305	510

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We maintain a sufficient stock at our plant to promptly fill orders from dealers.

SERVICE

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INFORMATION

Write us for catalog and samples, which will be cheerfully furnished, and we will advise you of the nearest source of supply.

ESTABLISHED 1868

CORNING GLASS WORKS

World's Largest Makers of Technical Glass

NEW YORK OFFICE
501 Fifth Avenue

MAIN FACTORY AND OFFICE
Corning, N. Y.

PRODUCTS

Glassware, mainly for Technical Requirements.

SERVICES

Corning Glass Works have made the production of technical glassware their special field for fifty years They maintain the most fully equipped laboratory in the world devoted to the study of the technical problems of glass manufacture The results of research conducted by Corning Glass Works have revolutionized some very important industries during the past twenty years We stand ready to cooperate with any manufacturer by developing special glasses to meet the particular requirements of his service if our present list does not afford exactly what is needed. The service of our chemists and physicists is at your disposal. Our designers can determine how to prevent unnecessary expense and how to secure maximum efficiency by avoiding unsuitable designs.

PYREX

An extraordinarily low expansion borosilicate glass Pyrex satisfactorily replaces porcelain and quartz glass for many purposes because of its low linear expansion coefficient (25° to 350° C = 0.0000032) The simple chemical composition of Pyrex is an advantage as regards possible contamination of liquids in contact with it It contains no metals of the magnesia-lime-zinc group and no heavy metals

Aside from Chemical ware and Baking ware, this glass is used for a great variety of special purposes, such as sight glasses, gauge tubes, etc.

BAKING WARE

Casseroles, plates, pans, etc. Also oven door plates, percolator flasks and tops; made from a low expansion borosilicate glass of unique properties, marketed under the trade-mark "PYREX."

CHEMICAL WARE

Beakers, flasks and special laboratory apparatus exclusively in PYREX glass.

CYLINDERS

In all diameters and lengths according to specifications from either lead or PYREX glass.

BATTERY JARS

For primary or storage cells in Corning "NONEX" (low expansion heat resisting) glass only; also Jars for Leyden cells.

BULBS

All types of standard bulbs, also special bulbs for X-ray apparatus.

LIGHT FILTERS

Glasses of special spectral absorption or transmission, such as:

Daylite, No G 172 CD, for production of artificial daylight, very accurate with Nitrogen filled lamp. Noviol, No G 38D, total absorption of ultra-violet. Noviweld, No. G 39, in various shades for protection against excessive illumination in arc welding and similar processes

Ultra No G 120, high transmission of ultra-violet No. G 11 F, high transmission of X-rays No. G 24, absorption of all visible spectrum except red.

OPTICAL GLASSES

Of special refractive indices and dispersion for lens-grinding, including lime crown glass of 1 523 index, lead flints of 1 6165 and 1.68 index,—also standard colors such as Amber, Smoke, Fieuzal, Amethyst, etc ; see also Light Filters above.

TUBING

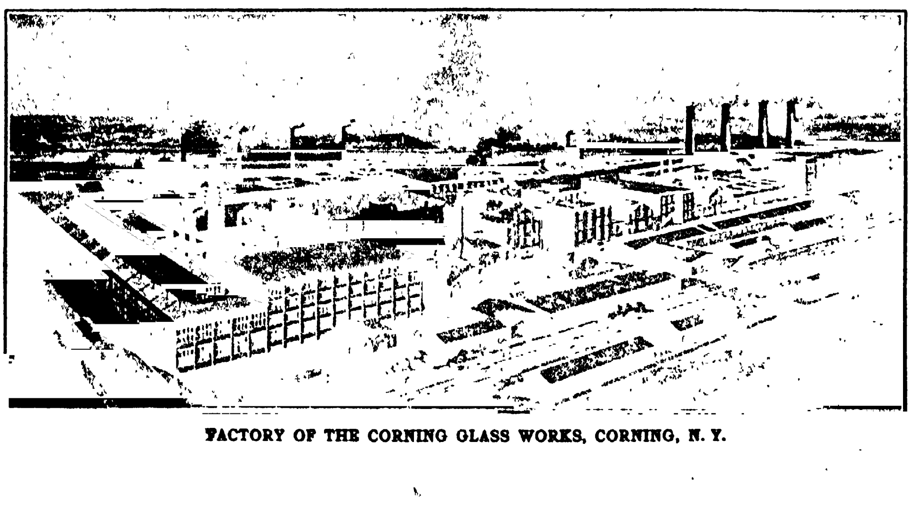
Including all varieties of Thermometer and Barometer tubing, Brewer, Clinical, Plaque, etc , in standard lead glass, also in Corning Normal and Corning Borosilicate Glasses Special tubes for acid condensers, for laboratory service, for lamp working, etc.

X-RAY SHIELDS

Glasses of special composition for protection against X-rays.

INQUIRIES

Address the Sales Department, Corning Glass Works, 501 Fifth Avenue, New York City, or Corning, N Y., for information, price list, descriptive circulars, etc.



FACTORY OF THE CORNING GLASS WORKS, CORNING, N. Y.

Crucibles, Gooch

With perforated bottom; glazed throughout except outside bottom surface.

Size number	2	2a	3	4
Diameter rim mm	27	33	35	40
Diameter bottom mm	18	20	22	25
Height mm	30	33	40	43
Diameter perforations, mm	1	1	1	1
Capacity, cc	10	20	25	35

Crucible Covers

For high form crucibles, glazed throughout

Size number	000	00	0	1	1a	2	3	4	5
Diameter, mm	32	35	42	47	56	59	71	81	95

Discs, Perforated

For Caldwell crucibles and for funnels; glazed on top surface.

Sizes 4 to 9 inclusive, with 60° beveled edge

Size number	0	1	2	3	4	5
Diameter mm	15	18	20	22	25	30
Thickness, mm	2	2	2	2	3.5	4
Diameter perforations, mm	1	1	1	1	1	1
Size number	6	7	8	9	10	11
Diameter, mm	38	50	60	75	100	150
Thickness, mm	4	4	4	4	6	6
Diameter perforations, mm	1	1	1	1	1	1

Dishes, Evaporating

With lip; Nos. 000 to 4 glazed throughout except rim; Nos. 5 to 13 glazed inside and half-way down outside.

Size number	000	00	0	1	2	3	4	5	6
Diameter, mm	60	70	80	85	90	100	110	120	145
Height, mm	24	27	30	33	37	42	44	50	48
Capacity, cc	35	60	80	100	140	175	210	300	385
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Diameter, mm	162	185	215	230	265	305	360	400	460
Height, mm	51	54	63	70	80	95	116	140	175
Capacity, cc	535	765	1285	1430	2200	3250	5700	10000	16500

Dishes, Evaporating

With wide lip and heavy welter rim; glazed inside and half-way down outside.

Size number	12	13
Diameter, mm	400	460
Height, mm	140	175
Capacity, cc	10000	16500

Dye Pots, See Beakers

Filter Cones

Glazed throughout except rim.

Size number	3	4
Diameter, mm	50	63
Height, mm	43	62
Diameter holes, mm	1.5	1.5

Funnels, Buchner

With fixed perforated plate; glazed throughout except rim.

Size number	0	1	2	2a	3	4	4a	5
Outside diameter, mm	48	66	82	102	122	138	163	200
Inside diameter mm	42	60	75	95	115	130	155	190
Diameter perforated area, mm	28	45	60	80	100	115	140	175
Distance, rim to perforated plate, mm	17	27	37	46	57	61	66	75
Height over all, mm	76	100	140	165	195	215	234	280
Length of tube, mm	46	50	70	80	90	100	110	130
Diameter of tube, mm	14	8	9	12	14	16	18	20

Funnels, Hirsch

With fixed perforated plate; glazed throughout except rim.

Size number	0000	000	00	0	1	2	3	4
Diameter top mm	54	50	75	92	103	120	140	163
Diameter perforated area, mm	16	28	28	28	28	45	45	60
Distance, rim to perforated plate, mm	26	12	18	33	41	45	62	69
Height over all, mm	66	61	95	121	131	158	185	217
Length of tube, mm	84	30	41	52	56	68	79	93
Diameter of tube, mm	12	10	10	12	14	15	16	17

Mortars with Pestles

With lip; glazed outside; Pestles glazed to grinding surface.

Size number	0	1	2	3	4	5
Diameter, mm	70	90	115	130	160	210
Height, mm	42	58	70	80	100	130
Capacity, cc	60	135	275	400	750	1900
Length of pestle, mm	110	135	170	190	240	240

Plates, Color

Glazed throughout except bottom surface.

Size number	1	2	3	4
Length, mm	110	160	180	180
Width, mm	90	125	110	140
Thickness, mm	7	10	10	10
Number of depressions	12	12	24	30
Diameter of depressions mm	20	30	20	20
Depth of depressions mm	5	5	5	5

Plates Desiccator

On three small feet; glazed on top.

Size number	0	1	2	2a	2b	3	4	5
Diameter mm	85	95	115	120	125	140	190	230
Thickness, mm	4	4	4	4	4	5	5	5
Number of holes	3	3	4	5	8	5	7	8
Diam of holes	23	30	30	23	23	30	30	30

Plates, Streak

Unglazed.

Size number	1	2	3	4	5	6
Length, mm	65	70	85	90	100	140
Width, mm	50	40	60	65	60	90
Thickness mm	3	3	4	4	4	4

Spatulas

Long Spatula on one end, knob on the other; glazed throughout.

Size number	1	2	3	4	5	5a	6
Length, mm	115	155	200	275	310	345	442

Spatulas

Spatula on both ends; glazed throughout.

Size number	1	2	3	4	5	5a	6	7
Length, mm	105	120	150	195	212	225	280	348

Spatulas

Spatula on one end, spoon on the other; glazed throughout.

Size number	1	1a	2	3	4	4a	5	6
Length, mm	96	120	140	160	190	203	247	400

Tubes, Pyrometer

Glazed outside only. Furnished glazed throughout on special order.

Size number	0	1	2	3	4	5	5a	6	7
Outside diameter, mm	10	12.5	14	17	20	28	30	38	60
Inside diameter, mm	6	10.5	10	12	15	20	25	28	43
Length, mm	1000	1000	1000	1000	1000	1000	1000	1000	1000

Porous Cells, Rectangular

Size number	0	1	2	3
Length, mm	70	135	305	340
Width, mm	20	50	63	195
Height, mm	90	170	305	335

Porous Cups, Cylindrical

Size number	1	2	2a	3	4	5	5a	6	7
Diameter, mm	25	30	38	25	40	52	50	55	76
Height, mm	76	76	75	102	90	100	126	150	127
Size number	8	8a	9	10	11	12	13	14	15
Diameter, mm	76	80	88	90	100	150	178	133	200
Height, mm	177	200	265	210	280	250	228	305	510

In addition to the above Porcelain Apparatus and Utensils, we manufacture Porcelain Acid Receivers, Ball Mills, Bottle Rests, Combustion Capsules, Graduated Pitchers, Glazed Plates, Mercury Troughs, Swimming Cups, Centrifuge Baskets, Bunsen Burners, Delivery Tubes, Combustion Tubes, Porous Filters, etc.

STOCKS

Coors Porcelain is carried in stock by the leading dealers in laboratory supplies throughout the United States and Canada. Should your dealer be temporarily unable to supply your needs, notify us and we will see to it that you are promptly supplied.

We maintain a sufficient stock at our plant to promptly fill orders from dealers.

SERVICE

We are at all times prepared to undertake the production of special forms of porcelain apparatus in quantity.

INFORMATION

Write us for catalog and samples, which will be cheerfully furnished, and we will advise you of the nearest source of supply.

CRANE CO.

Manufacturers of Valves, Fittings, Steam Specialties

GENERAL OFFICES
836 South Michigan Avenue, CHICAGO, ILL.
WORKS: CHICAGO, ILL., and BRIDGEPORT, CONN.

SALES OFFICES

ABERDEEN
ALBANY
ATLANTA
BILLINGS
BIRMINGHAM
BOSTON
BRIDGEPORT
BROOKLYN
BUFFALO
CAMDEN
CHICAGO
CINCINNATI
DAVENPORT
DES MOINES
DETROIT
DULUTH
FARGO
GRAND RAPIDS
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LITTLE ROCK
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MINNEAPOLIS
MUSKOGEE
NEWARK
NEW YORK
OAKLAND
OGDEN
OMAHA
OKLAHOMA CITY
OSHKOSH
POCATELLO
PORTLAND, ORE.
PHILADELPHIA
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CRANE LIMITED

MONTREAL
SYDNEY, N. S. W.
TORONTO
QUEBEC
VANCOUVER
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LONDON, ENG.
CALGARY

PRODUCTS

We manufacture a complete line of Valves, Cocks, and Fittings in brass, iron, ferrosteel and cast steel used by the chemical industries; malleable and cast iron screwed fittings, drainage fittings; hydraulic valves and fittings; flanged fittings of every description; steam specialties; automatic stop-check valves; emergency, exhaust relief and back-pressure valves; steam and oil separators; steam traps; pop safety and relief valves; Indicator posts; floor stands; geared valves and valves with floor stands; hydraulic lift gate valves; motor operated valves; clean-out pockets; emergency engine stop valves; throttle valves; pressure regulators; temperature control valves; open-float steam traps; blow-off valves; packing; unions; expansion joints; gate valves; globe, angle, cross and check valves; radiator valves; flanged pipe joints; valves and fittings for ammonia; steel valves and cast steel fittings especially constructed for superheated steam.

Estimates furnished from drawings submitted on complete piping equipment, pipe bends, etc.

We are distributors of pipe, heating and plumbing materials.

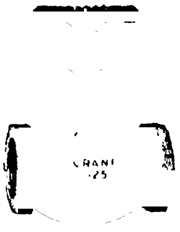
Any of the above articles will be cast in special metals to withstand the action of acids, etc., when so ordered.

The following material is especially adapted for use in chemical plants.

ALL IRON GLOBE AND ANGLE VALVES, No. 348

Sizes ½-inch and larger All parts made of iron; also made brass mounted.

Large sizes with outside screw and yoke with iron body or all iron.



NO. 348

BRASS GLOBE AND ANGLE VALVES, No. 7

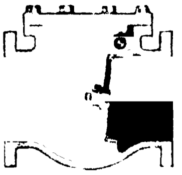
Made with Jenkins disc, brass body, malleable iron centerpiece ring, packing nut and wheel. Sizes ¼ to 2-inch.

NO. 7

STANDARD IRON BODY SWING CHECK VALVES (No. 373)

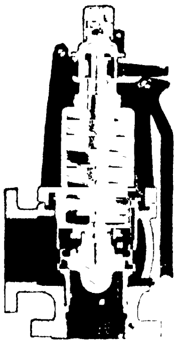
Made with brass faced or leather disc for 125 pounds steam working pressure.

The extra heavy pattern, with brass faced disc, is suitable for 250 pounds steam working pressure. Sizes 2-inch and larger.


NO. 373

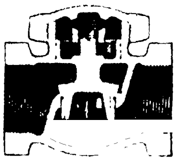
POP SAFETY VALVES (No. 1117)

Made in various spring loaded types to meet all conditions of service Outside spring and yoke valves for any pressure up to 250 pounds are made to comply with the requirements of the A S. M E Boiler Code. Sizes 2½ to 4½-inch.


NO. 1117

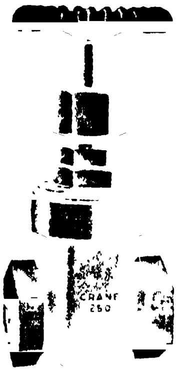
BRASS LIFT CHECK VALVES (No. 92 E)

An extra heavy lift check valve with a dashpot Made in sizes ¼ to 3-inch.


NO. 92E

EXTRA HEAVY BRASS GATE VALVES (No. 66 E)

A very heavy valve of the wedge disc type for 250 pounds steam. pressure. Made in sizes ⅜ to 3-inch.



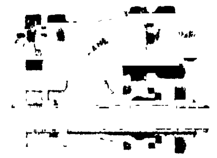
NO. 66E

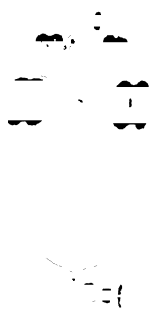
Continued on Next Page

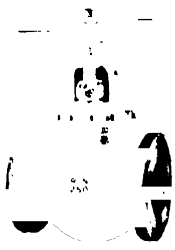
AMMONIA VALVES AND FITTINGS

Standardized so the trimmings of different valves, as well as the valves and fittings themselves, may be interchanged without changing the length of connecting pipe lines Made with tongue and groove ends

NO. 1504 AMMONIA GLOBE VALVE


NO. 1575 RETURN BEND


NO. 1594 AMMONIA OIL SEPARATOR


NO. 21E STEEL GLOBE VALVE

Steel valves are made with different materials for the trimmings, depending on the service requirements

NO. 23E STEEL ANGLE VALVE

EXTRA HEAVY CAST STEEL SWING CHECK VALVES (No. 39 D)

Made with cast steel body and hard metal seats. Designed for use on boiler feed lines carrying pressures up to 400 pounds

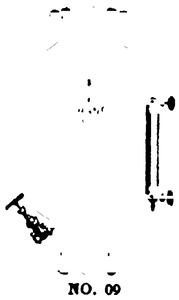
NO. 39-D

PRESSURE REGULATORS

Made for any initial pressure of steam or air up to 250 pounds, also for superheated steam at 200 pounds, or a total temperature not to exceed 500 degrees F

NO. 962 PRESSURE REGULATOR

STEAM AND OIL SEPARATORS


NO. 09 STEAM SEPARATOR

Made in several patterns: low pressure up to 25 pounds, standard up to 125 pounds, extra heavy up to 250 pounds

NO. 08 OIL SEPARATOR

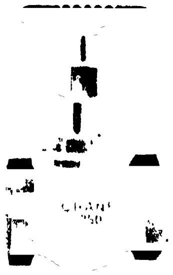
CRANETILT STEAM TRAPS

Made in three types; non-return, three-valve lifting or vacuum; direct return Write for circular on condensation

CRANETILT THREE-VALVE LIFTING TRAP

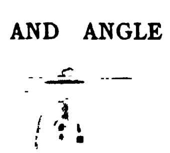
EXTRA HEAVY HARD METAL GLOBE AND ANGLE VALVES (No. 4)

Made for severe service Body and disc made of "hard metal" which is almost as hard as steel and successfully resists the cutting effects of steam and water Sizes ¾-inch and larger have a gland For steam working pressures up to 250 pounds


NO. 4

EXTRA HEAVY HARD METAL STEAM COCKS

Made of "hard metal" with liberal bearings and carefully finished. This cock will stay tight and give good service for steam working pressures up to 250 pounds



NO. 80-E SQUARE HEAD

EXTRA HEAVY BRASS GLOBE AND ANGLE VALVES (No. 87 E)

Made outside screw and yoke for 250 pounds steam working pressure Bolted gland, renewable seat ring, Crane special brass body and yoke, Crane hard metal disc and seat, brass gland and nuts, brass bonnet nuts. Made in sizes 1½ to 4-inch.

NO. 87-E

CRESSON-MORRIS COMPANY

Engineers, Founders, Machinists

18TH STREET AND ALLEGHENY AVENUE, PHILADELPHIA, PA.

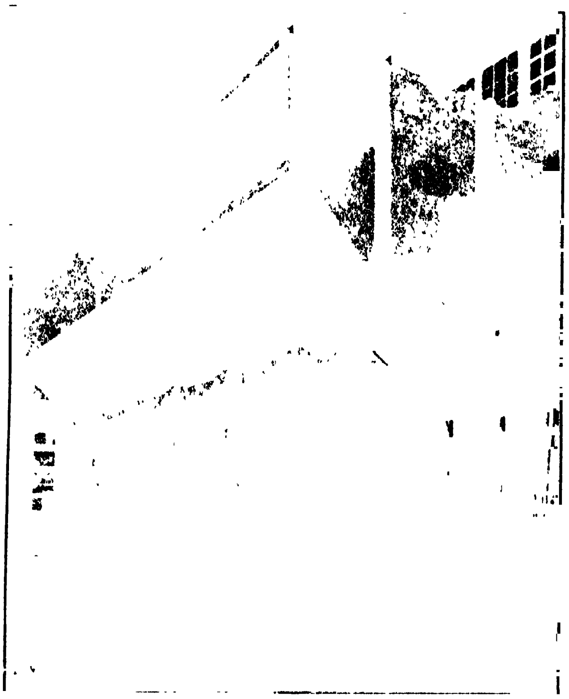
SALES OFFICE 4701 Woolworth Building, New York, N. Y.

PRODUCTS:

Morris-Weston Ball-Bearing Centrifugals
Centrifugal Clarifiers (Resines Process)
Mixers, Conveyors, Elevators
Power Transmission, Gears
Hydraulic Tankage Presses.

CENTRIFUGALS:

Centrifugals are made in sizes of 48", 40", 36", 30". Mounted singly or in batteries for use in chemical plants and sugar factories. Mixers and framing to suit any requirements.



BATTERY OF 6 40-INCH MORRIS-WESTON CENTRIFUGALS

CENTRIFUGAL CLARIFIER:

Separates solids held in suspension in liquids. Eliminates excessive tank capacity because sedimentation is continuous and instantaneous.

Force 500 to 600 times that of gravity.

Uses no filter cloths, either fabric or metal.

Cannot become clogged.

Exempt from pressure pump troubles.

Results easily controlled.

CENTRIFUGAL CLARIFIER

Resines Process (Patented)

For Sugar Factories—Cleans raw sugar juice.

Removes bagacillo and all mineral bodies held in suspension.

Prevents deterioration of sugars.

Increases sugar recovery.

Reduces purity of final molasses.

Hastens concentration in Effects and Vacuum Pans.

Permits liquidation of factory within few minutes after mill ceases to grind.

Removes large percentage of impurities which are insoluble while juice is cold but which become soluble when heated. The elimination of all excess lime, other mineral salts and earthy matter from the juice while they are in suspension permits the crystallization of a greater percentage of contained sucrose.

Number of filter presses reduced 75%, as they handle albumenoids only. Filter presses can be entirely eliminated by passing juice a second time through the clarifier after being heated.

Process does not interfere with any existing methods. The more modern the milling plant and the greater the extraction of sucrose, the greater will be the saving.

Continued on Next Page

DIRECT ELECTRICALLY DRIVEN CENTRIFUGALS

Quick acceleration and short cycle

40″ x 24″ DIRECT ELECTRICALLY DRIVEN CENTRIFUGAL

No belts to give trouble.

Made in 40″ and 48″ sizes both standard and self discharging baskets

Motor has two speeds with interlocking switch and brake

An ideal machine for drying sugar in refineries, first sugars in raw sugar factories, salt and chemical works.

WATER DRIVEN CENTRIFUGALS

Fast or slow acceleration Variable speed.

Ideal for chemical or salt works, also sugar factories where variable acceleration and different speeds are required

Power to operate derived from pump, using same water over and over with slight make up.

No belts or wires to give trouble in Corrosive Atmosphere.

Made in 40″ and 48″ sizes with both standard and self discharging baskets

40″ x 24″ WATER DRIVEN CENTRIFUGAL

CROWELL MANUFACTURING COMPANY

Sole Manufacturers, Under Patents, of

Crowell Rotary Air Compressors, Pressure Blowers and Vacuum Pumps

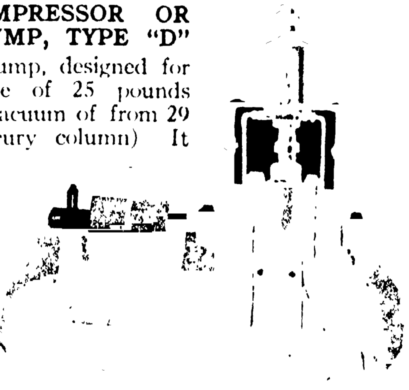
319-321 Franklin Avenue
BROOKLYN, N. Y., U. S. A.

PRODUCTS

Sole manufacturers under Patents of Crowell Rotary Air Compressors, Pressure Blowers, and vacuum Pumps for all Kinds of Laboratory Work, Chemical and Steam Heating Plants, Gas or Oil Furnaces, Blow Pipes, etc., also Air Receivers.

ROTARY COMPRESSOR OR VACUUM PUMP, TYPE "D"

Single-stage pump, designed for working pressure of 25 pounds per sq in, or vacuum of from 29 to 30 in (mercury column) It is of simple, positive and durable action, having no valves, springs, gears or unbalanced parts, and requiring no special foundation.



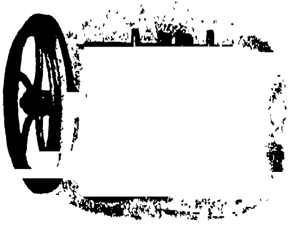
TYPE "D" COMPRESSOR OR VACUUM PUMP

All sizes of the Type "D" Compressors or Vacuum Pumps can also be furnished set up on a special bed plate and connected by silent chain drive with motor as illustrated These outfits are made up to order only and as per specifications as to motor, etc, and prices will be quoted accordingly

TYPE "D" COMPRESSOR OR VACUUM PUMP WITH REGULAR MOTOR DRIVE

ROTARY VACUUM PUMP, TYPE "O-D"

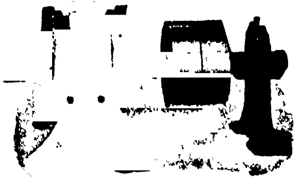
For use in small laboratories and all other experimental work Designed for intermittent operation, and specially adapted for vacuum work; can exhaust to a vacuum of from 29½ to 30 in. (mercury column). Fitted in oil immersion box, which makes it leakproof, or can be used without box. Capacity about 2 cu. ft. of free air per minute requiring ¼ h. p. to operate.



TYPE "O-D" PUMP IN OIL IMMERSION BOX
Price (with oil box), $66 00 — (without) $55 00
Weight (with oil box), 50 lbs. — (without), 20 lbs.

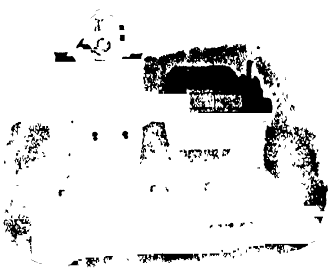
POSITIVE PRESSURE BLOWERS, TYPES "A" AND "B"

Adapted for all purposes requiring air under pressure of 1 to 8 pounds per sq in, or any degree of vacuum not exceeding 20 in.



Type "A," sizes from 5 up, fitted with end bearing

Construction, same in both types, consisting of an internal drum and shaft carrying sliding blades or pistons operating in close contact with cylinder walls, giving simple positive action No springs, gears, valves, or unbalanced parts, and pressure not dependent upon high speeds or centrifugal force.



Type "B"
Positive Pressure Blower

DATA, POSITIVE PRESSURE BLOWERS, TYPES "A" AND "B"

General Details Types "A" and "B"							Type "A"			Type "B"		
	Free Air Capacity											
Size No	Cubic Inches per Rev	Cubic Feet per Min at Max Speed	Rev per Min Max Speed	H P Approx at 3 Pounds Pressure	Pulleys, Inches	Pipe Size, Inlet and Outlet, Inches	Net Weight, Pounds	Floor Space, Inches	List Price	Net Weight, Pounds	Floor Space, Inches	List Price
1	20	6 9	600	1/8	4x1	1/2	24	10 x 6¼	$28 00	42	14x10	$38 00
2	45	13 0	500	1/4	4x1½	3/4	34	12½x 6½	36 00	55	16x11	46 00
3	125	25 3	350	1/2	6x2½	1	90	22 x14	58 00	145	25x20	68 00
4	280	40 5	250	1	9x3	1¼	170	28 x17	75 00	240	30x23	85 00
5	460	53 2	200	1½	10x3	2	225	34 x20	110 00	330	37x25	125 00
6	690	79 8	200	2	12x4	2	320	38 x20	150 00	570	41x25	170 00
8	1050	121 5	200	3½	14x6	2½	575	48 x22	210 00	790	50x27	250 00
10	1660	192 0	200	5	18x6	3	770	54 x28	280 00	1050	56x33	345 00
12	3390	392 3	200	7	20x6	4	1300	60 x31	480 00	1770	62x36	545 00

DATA, TYPE "D" ROTARY COMPRESSOR OR VACUUM PUMP

	Free Air Capacity								
Size No	Cubic Inches per Rev	Cubic Feet per Min. at Max. Speed	Rev per Min. Max. Speed	Approx. H. P. at 15 Pounds Pressure or 29 Ins. of Vacuum	Pulleys Tight and Loose, Ins.	Approx Net Weight. Pounds	Pipe Size, Inlet and Outlet, Ins.	Floor Space, Ins.	List Price
1-D	16	4 3	600	3/4	6x2	70	1/2	13x18	$78 00
2-D	40	9 2	400	1	8x2	115	3/4	14x22	95 00
3-D	100	17 0	300	2	12x4	250	1	19x34	125 00
4-D	280	40 5	250	4	14x4	425	1½	23x38	220 00
5-D	400	46 0	200	5	18x6	580	2	26x44	245 00
6-D	600	69 4	200	6½	18x8	725	2	26x55	320 00
8-D	1000	115 7	200	9	20x8	1150	2½	30x64	440 00
10-D	1650	190 9	200	12	22x10	1675	3	36x70	650 00
12-D	3390	392 0	200	20	24x10	2150	4	38x75	1000 00

CRUSE-KEMPER COMPANY

Engineers, Contractors, Manufacturers

WORKS AND OFFICE

AMBLER, PENNSYLVANIA

PRODUCTS

Gas Holders, for storage of gases. Multiple and single lift.

Steel Plate Structures, of every description.

Tanks, for storage, mixing and treatment of water, oils, acids, etc.

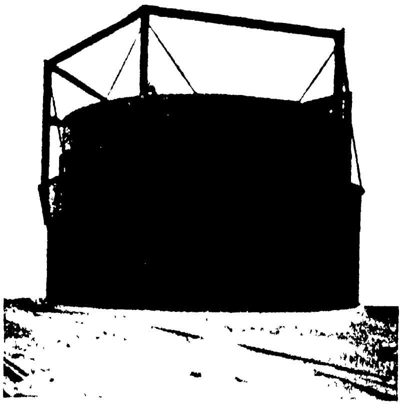
Bins, for storage of lime, ores, coal, ashes, etc.

Purifiers, wet and dry types.

Chutes and Conveyors, for handling any material.

Furnaces, plain and water-jacketed.

Kettles
Flumes
Flues
Hoppers
Stacks
Stills



SINGLE LIFT GAS HOLDER

33 feet diameter, 12 feet deep, in steel tank 35 feet diameter, 12 feet 4 inches deep Capacity, 10,000 cubic feet Made 500 to 100,000 cubic feet Multiple lift holders for 75,000 to 5,000,000 cubic feet

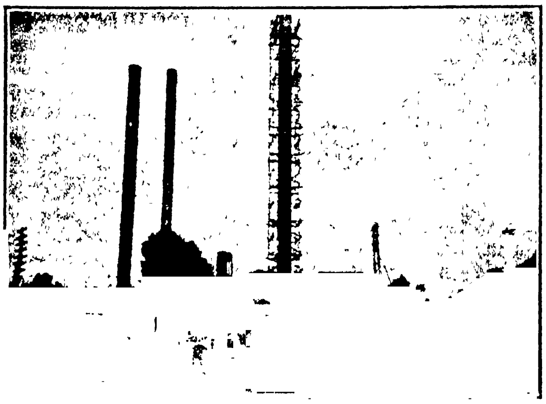
GAS HOLDERS

In the construction of our gas holders every inch is caulked, metal to metal, gas tight, as assembled Furthermore, they stay tight

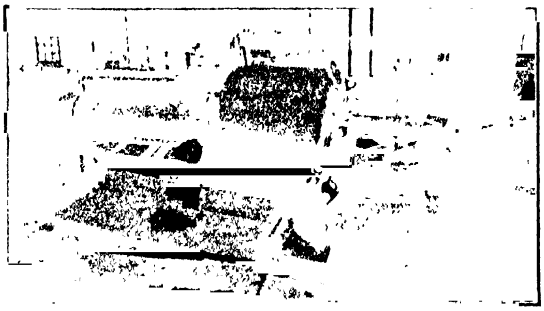
STEEL PLATE CONSTRUCTION

This Company designs, fabricates and erects any type of structure of steel plate, or works to customer's designs. The illustrations below show erection in progress in Porto Rico and work in our yard a boiler breeching, oil tanks and buoy for the Government, and chemical settling pans.

BOILER BREECHING



ERECTION IN PROGRESS IN PORTO RICO



OIL TANKS, CHEMICAL SETTLING PANS, AND A BUOY BUILT FOR THE GOVERNMENT

ALPHONS CUSTODIS CHIMNEY CONSTRUCTION CO.

Designers and Builders of Radial Brick Chimneys

95 NASSAU STREET, NEW YORK, N. Y.

BRANCH OFFICES

Chicago, Ill., Marquette Building
Boston, Mass., 51 Ellery Street
Detroit, Mich., Moffat Building
Pittsburgh, Pa., Empire Building
Philadelphia, Pa., Pennsylvania Bldg

Seattle, Wash., Colman Building
Atlanta, Ga., Healey Building
Richmond, Va., American National Bank Bldg
Cleveland, O., Guardian Building

Milwaukee, Wis., 641 Wells Building
Baltimore, Md., 521 Equitable Building
Toronto, Ont., Canada, Kent Building
Montreal, P. Q., Canada, 10 Cathcart Street
Portland, Ore., 222 Pine Street

PRODUCTS

Designers and Builders of Perforated Radial Brick Chimneys, with Foundation and Flues, of all sizes, for chemical industrial plants, smelters, paint works, furnaces, boilers, crematories, ovens; acid proof chimneys, high temperature chimneys for destructors and incinerators. Chimneys for melting crucibles and blast furnaces, and specially designed chimneys to resist all kinds of acids.

Builders and Designers of the **Tallest** and **Largest Chimney** in the **World.**

ANACONDA COPPER MINING CO., Anaconda, Montana. Height, 585′ above grade. Top diameter inside, 60′.

SERVICES

Specifications, plans, designs and data furnished free upon request.

The **Alphons Custodis Chimney Construction Co.,** through its forty years of experience, is equipped to give expert advice as to the size, shape and design of any kind of a chimney for any purpose. It is particularly competent in designing acid proof chimneys to resist the action of acids.

Every chimney is designed for the particular service expected of it. Different kinds of acids, concentrated, diluted, wet or dry, and all different chemical combinations require special designs to meet each particular case.

If you will state the conditions, the nature of the acids and the results desired, the Engineers of this Company will promptly give the correct, efficient and economical size and design of chimney, not from theoretical tables, but from forty years' experience and unpublished data collected from actual working conditions of our chimneys all over the world.

In the case of chimneys for Boilers, the coal used, temperatures, gases generated, geographical location and many other conditions affect the determination of the most economical and efficient size and design of a chimney.

Tell us your conditions and we will make recommendations.

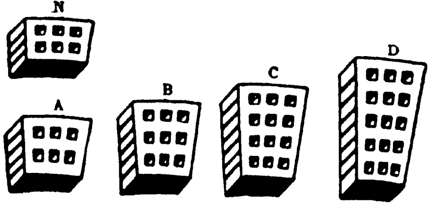
The fact that over 10,000 Custodis Radial Brick chimneys are now in successful operation is sufficient proof of their permanency, efficiency and economy.

"ACID PROOF CHIMNEY"
Built for the Heller & Merz Company, Newark, N. J.
350′ high x 8′0″ inside diameter at the top. Built in 1904

DESCRIPTION

The perforated radial blocks are made only from the purest clays, selected for high refractory powers and high crushing strength and the resistance of acid. Special attention is given in our brick yards to making the proper mix of clays in the right proportion to produce a radial chimney brick which will resist heat strains, as well as strains from weight and wind.

All the radial blocks are formed to suit the circular and radial lines of each part of the chimney, so that they can be laid with thin, even joints and produce a regular smooth surface.



PERFORATED RADIAL BLOCKS
Manufactured in sizes and shapes suitable for all chimney diameters

The blocks are larger than common brick, making the number of mortar joints in a radial brick chimney one-third of those in a common brick chimney of the same size.

Molded with vertical perforations, as shown in the illustration, the radial blocks are most thoroughly and uniformly burned, increasing, to a marked degree, their density and strength. The perforations form a dead air space around the chimney, insulating the hot column of rising gases on the inside from sudden changes of temperatures of the outer air, resulting in a maximum draft under all conditions.

INFORMATION REQUIRED

When requesting estimates, please give the following information

Name of place where chimney is to be erected.
On what railroad siding located
Distance from siding to chimney site
Is chimney to be used for boiler draft or other purposes
If required to handle acids, state nature of acids and whether wet or dry, diluted or concentrated
Give probable temperatures of the flue gases
If for boiler draft, what is total horsepower
Kind of fuel or coal to be used
Amount consumed per horsepower or total per hour
Dimensions of chimney required—diameter, height
Is arrangement for overhead or underground flue
Give dimensions and shape of flue opening desired in chimney
Give height above or below foundation top
Nature of soil where chimney will stand.
Estimated safe load per square foot
Depth of excavation necessary to reach good soil
Latest date allowed for erection of chimney
Sketch showing arrangement of building, boiler and chimney.
Local prices—red brick, lime, cement and sand.

D & W FUSE WORKS

OF GENERAL ELECTRIC COMPANY

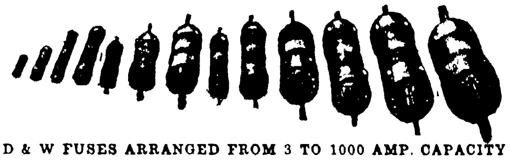
Fuses and Wiring Supplies
PROVIDENCE, R. I.

PRODUCTS

D & W Fuses; Fuse Accessories; Oil Fuse Cut-outs; Deltabeston Asbestos Insulated Wires; Insulating Tape and Sheeting.

D & W FUSES

The manufacturers of D & W fuses have incorporated the soundest engineering principles in the design of each individual fuse, and the closest attention is given to all details in manufacture. The result is a fuse that is accurate in operation and that protects equipment under the most exacting conditions. D & W fuses range in size from 1 to 1000 amperes for all standard voltages.



D & W FUSES ARRANGED FROM 3 TO 1000 AMP. CAPACITY

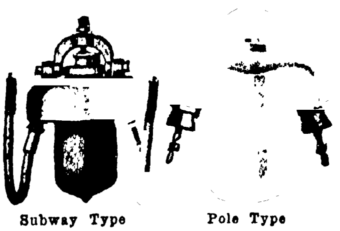
FUSE ACCESSORIES

D & W fuse accessories include enclosed fuse cut-outs, cut-out bases, fuse boxes, fuse links and clips, service switches, telephone and telegraph protectors, etc. The same quality of workmanship and material enters into these devices as is found in D & W fuses and other products

Further information is given in Catalog No. 15, mailed on request.

OIL FUSE CUT-OUTS

Oil fuse cut-outs are designed to protect all classes of circuits and are especially desirable for junction and primary protection near the source of current They are made in four types standard and heavy service pole types and standard and heavy service subway types. Heavy service types have increased interrupting capacities over the standard service types. The pole types, designed for overhead circuits, range in size from 50 to 300 amperes at 2200 volts and up to 13,200 volts in smaller sizes. The subway types have the same ratings, and are especially protected against the entrance of moisture and water. This type performs satisfactorily even when totally submerged in water for days. Both types permit fuses to be renewed with ease and safety. D & W oil fuse cut-outs combine accurate overload protection with high interrupting capacity.



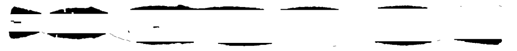
Subway Type   Pole Type

50-200 AMPERE OIL FUSE CUT-OUTS

WIRES AND CABLES

Deltabeston Wires are asbestos insulated. Hence any form or variety will give practically permanent service when subjected to heat. After the insulation has been applied to the wire, in all except two types, the asbestos is filled with a waterproof compound which renders the finished product vaporproof as well as heatproof. Furthermore, experience has demonstrated that Deltabeston Wire will withstand also many chemical fumes and therefore is of particular importance to the chemical industry. Detailed information now available will be sent gladly to any manufacturer.

Deltabeston Magnet Wire is used chiefly for winding coils in motors which run hot either because they are overloaded or because of their location with reference to external heat Moreover, in many instances motor coils break down because of chemical action on the insulation of the Magnet Wire and while Deltabeston Magnet Wires cannot be guaranteed to withstand every known fume, there are very many applications for this wire in the chemical field The insulation consists of asbestos fiber applied to the wire in a felted form and then impregnated This insulation is of approximately the same wall thickness as double cotton covered magnet wire Deltabestos Magnet Wire can be furnished round in sizes from No. 0 to No. 20 inclusive, rectangular and square.



Deltabeston Heater Cord is furnished either with a cotton braid over the felted insulation of the two conductors or with an impregnated asbestos braid. The latter form of heater cord is known as type A. Cord and is more suitable for use in the chemical industry This is due to the filled outer asbestos braid which resists abrasion and is heat and moisture proof.

Deltabeston Miscellaneous Wires serve a variety of purposes wherever heat is a factor in a wiring installation. Like Deltabeston Magnet Wire the insulation consists of felted asbestos, the only difference being in the wall thickness. The insulation is from .027 to .030 in. or approximately 1/32 in. thick.

Deltabeston Motion Picture Cable is a very flexible, stranded conductor finished with a filled asbestos braid. It is of service where flexibility and resistance to heat are important factors. It is used for wiring on cranes, controllers and search-lights as we'l as Motion Picture apparatus.

This Company manufactures also Stove Wire, used chiefly for wiring electric stoves and ranges; Switchboard Wire, of practically the same construction; and Fixture Wire, used in connection with the wiring of lighting fixtures.

INSULATING MATERIALS

Deltatape is a high heat resisting material having asbestos fiber as a base. Its thinness and flexibility make it especially applicable on covers and terminals of coils and between turns of flat wound motor coils. It can be furnished in any thickness from 10 to 25 mils., widths ranging from ¼ to 1½ in.

Delta sheeting is the same in properties, texture, and finish as Deltatape. Furnished in rolls of any convenient length, the standard width being 8 in.

Established 27 Years

A. DAIGGER & COMPANY

Exporters, Importers, Manufacturers and Dealers
Laboratory Supplies and Chemicals

54-60 West Kinzie Street
CHICAGO, ILLINOIS

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(INDUSTRIAL CHEMICALS)

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We specialize in supplying the following industries from stocks carried in Chicago as well as for shipments from other plants:

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- Enamelers, etc.
- Ink Manufacturers
- Glue and Paste Manufacturers
- Packers
- Paint Manufacturers
- Paper Manufacturers
- Perfumers
- Rubber Manufacturers
- Shoe Polish Manufacturers
- Smelters and Refiners
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- Tanners
- Textile Mills
- Varnish Manufacturers
- Wall Paper Mills

Ask for our Heavy Chemical Catalog

Your inquiries are solicited.

We sell Technical and Chemically Pure Materials of all kinds in Quantities from One Gram to Carloads.

D & W FUSE WORKS

OF GENERAL ELECTRIC COMPANY

Fuses and Wiring Supplies

PROVIDENCE, R. I.

PRODUCTS

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D & W FUSES ARRANGED FROM 3 TO 1000 AMP. CAPACITY

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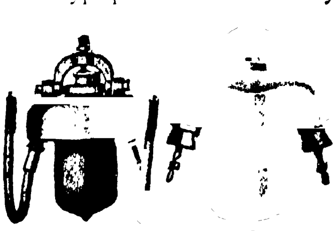

Subway Type Pole Type

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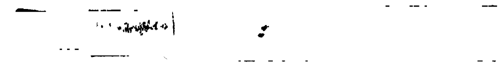

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Delta sheeting is the same in properties, texture, and finish as Deltatape. Furnished in rolls of any convenient length, the standard width being 8 in.

ESTABLISHED 1875

G. M. DAVIS REGULATOR CO., Inc.

Manufacturers of Davis Valve Specialties for Chemical Industries

425 Milwaukee Ave., CHICAGO, ILL.

Branches in all principal cities

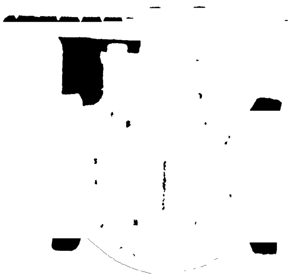
PRODUCTS

Pressure Regulators, Stop and Check Valves, Exhaust Relief Valves, Back Pressure Valves, Balanced Valves, Float Valves, Steam Traps and other Steam Specialties.

BALANCED VALVES

Designed for working pressures up to 200 pounds. Can be used with steam, air, gas or water Well adapted for feed-water heaters, condensation tanks, hot wells, and for all purposes requiring a valve which is not affected by internal pressure Sizes ½ to 14 inches

BALANCED VALVE
Screwed or flanged ends



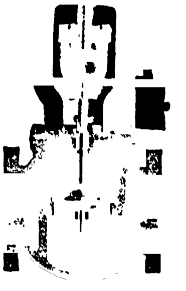
BACK PRESSURE VALVE
Screwed or flanged ends

BACK PRESSURE VALVES

Maintain any desired back pressure in an exhaust steam line. Double piston type valve. Will not stick or bind, and is noiseless in operation Sensitive and accurate. Sizes 2 to 30 inches

STOP AND CHECK VALVES

For preventing reverse flow of steam. Made with oil dash-pot; absolutely reliable For any working pressure up to 350 pounds and any temperatures up to 800° F. Sizes 2 to 12 inches.



STOP AND CHECK VALVE
Globe or angle pattern

FLOAT VALVE
Screwed or flanged ends

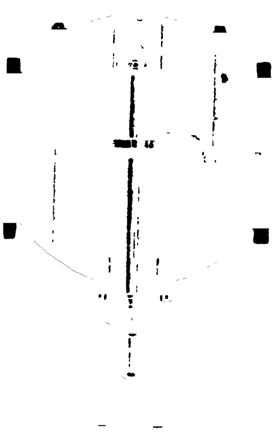
FLOAT VALVES

For automatically controlling water supply to tank, or reservoir. Keeps water at constant level. Single seat with renewable composition disc makes it close tight without leakage. Sizes ½ to 14 inches.

PRESSURE REGULATORS

For high or low pressures; steam, air or water Automatically reduces from any operating pressure to any lower pressure Equipped with oil dash-pot, which insures steady operation. Sizes ½ to 14 inches

PRESSURE REGULATOR
Screwed or flanged ends



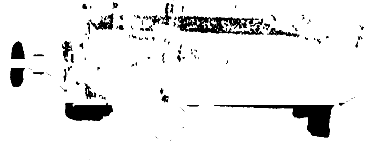
EXHAUST RELIEF VALVE
Flanged ends only

EXHAUST RELIEF VALVES

Protect condenser equipment from damage by pressure. Full pipe opening Equipped with dash-pot, which makes the operation steady and noiseless Made in either horizontal or vertical types. Sizes 6 to 48 inches

IMPROVED STEAM TRAP

Automatically removes water of condensation from steam pipes without loss of steam. Discharges continuously under any pressure and against any lower pressure. Double-cone-shaped balanced valves Water-sealed to prevent steam leakage.



IMPROVED STEAM TRAP

LITERATURE

These are a few of the Davis Valve Specialties more widely used in the chemical industries. There is a "Davis" designed especially for every duty. They are all completely illustrated and explained in the new Davis Catalog. Write for your free copy to the G. M. Davis Regulator Co., 425 Milwaukee Ave., Chicago.

THE J. H. DAY COMPANY

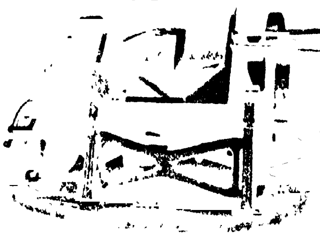
FACTORY AND MAIN OFFICE
1144 HARRISON AVENUE, CINCINNATI, OHIO
BRANCHES
New York Boston Philadelphia Buffalo Chicago Kansas City San Francisco

PRODUCTS

Mixers, Kneaders, Grinders, Sifters, Blenders, Emulsifiers, Disintegrators, Package Fillers, Kettles, Racks, Trucks, Tanks and Special apparatus for handling Dry, Liquid, Powder, Granular, Dough and Paste Materials. Made water-cooled or jacketed and with Galvanized or Enameled Tanks when required.

DAY IMPERIAL MIXER

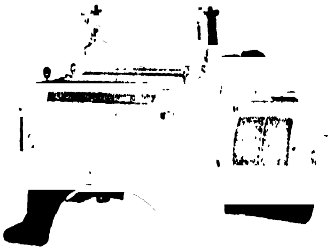
For heavy plastic materials. With or without Steam Jackets. 4 sizes. Capacity, 50, 70, 110, 220 gals.



IMPERIAL MIXER

THREE-ROLL PIGMENT AND PASTE MILL

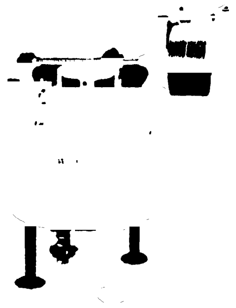
For Paints, Printing Ink, Chocolate. Rolls: 5″ x 12″, 12″ x 32″, 16″ x 28″, 16″ x 40″.



PIGMENT AND PASTE MILL

STEAM JACKETED KETTLES AND MIXERS

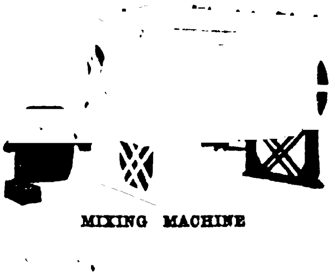
For cooking and heating materials that require constant stirring. Variation in agitators can be made to suit requirements. 10 sizes. Capacity, 20 to 1000 gals.



STEAM JACKETED KETTLE

PLAIN AND JACKETED MIXING MACHINES

For all grades of material used by Rubber Manufacturers, by Manufacturers of Explosives, and in all lines where mixing is done. Capacities from 10 lbs. to 10 tons.



MIXING MACHINE

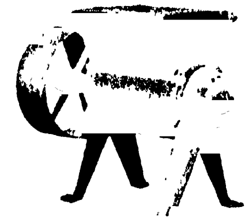
HANCE CONICAL PLATE DRUG MILLS

Made in two sizes: adjustable for different fineness. For hand power or pulley drive. The only Mill that can be cleaned quickly.

DRUG MILL

DAY HERCULES CRUSHER

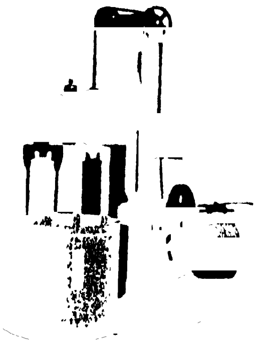
For Filter Press Cakes, Clays, Chemicals and all materials required crushing before being pulverized. Has large capacity.



HERCULES CRUSHER

DAY BRIGHTON MIXER

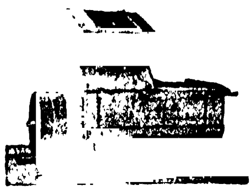
20, 80 and 175-gallon capacity. Rapid mixing of all kinds of paste preparations.



BRIGHTON MIXER

SIFTERS AND MIXERS

For all powdered and granular materials. Capacities, 10 lbs. to 5,000 lbs. With steam jacket when desired.



SIFTER AND MIXER

DAY LIGHTNING DISINTEGRATOR

Made in three sizes; for coarse, medium or fine grinding; suitable for grinding filter press cakes, clay, cork, glue, resin, roots, barks, etc.

WRITE FOR OUR CATALOGS

DISINTEGRATOR

JULIAN D'ESTE COMPANY

Manufacturers of Steam Specialties
Engineers, Machinists and Brass Founders
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Cable Address
"HULL", Boston

AGENCIES
New York, N. Y., 180 Washington Street
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FACTORY Charlestown, Mass

PRODUCTS

Curtis Engineering Specialties, which include:

Regulators; Damper, Temperature, Water, Air, Steam, Pumps and Steering Engine.

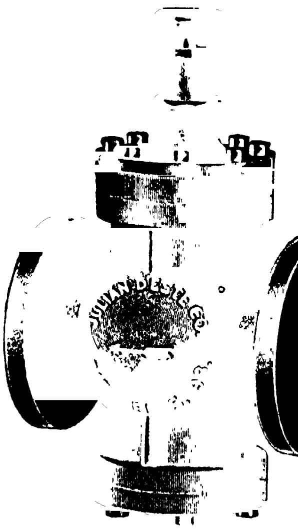
Steam Traps; Balanced, Return, Expansion and Bucket.

Balanced Valves, Steam Separators and Ballcocks.

IMPROVED STEAM PRESSURE REGULATOR

Made entirely of metal, a lock valve and very sensitive. It has no levers, weights, projections, glands or packing. There is no drip or leak of steam or water and all that passes into it passes through it. Suitable for boiler pressure up to 200 lbs.

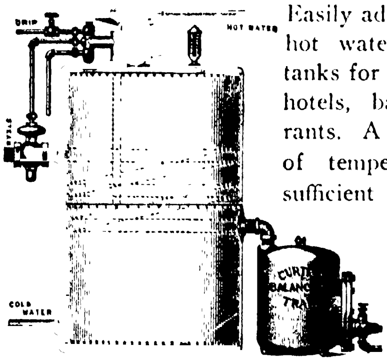
Sizes: ½"-1½"—all bronze, screwed ends. 2" screwed ends. Iron body with bronze mountings. 2½"-12" flanged ends. Iron body with bronze mountings.



IMPROVED STEAM PRESSURE REGULATOR

CURTIS TEMPERATURE REGULATOR

Will control any temperature 0.0° F. to 300° F. Easily adapted to steam or hot water boilers, or to tanks for heating water for hotels, baths, or restaurants. A minimum change of temperature produces sufficient movement to do the work. Power is unlimited.



CURTIS TEMPERATURE REGULATOR

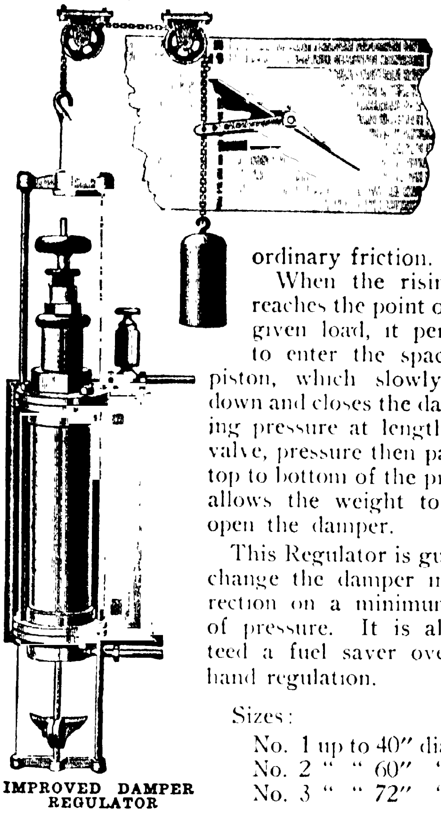
Sizes: ½" to 8" inclusive.

IMPROVED DAMPER REGULATOR

The Regulator is actuated by steam pressure and consists of a gunmetal cylinder, within which is a piston fitted with water packing. The piston rod is connected by a chain to the lever of the damper, on which hangs a weight sufficient to overhaul the piston and open the damper, regardless of any ordinary friction.

When the rising pressure reaches the point of lifting the given load, it permits steam to enter the space over the piston, which slowly pushes it down and closes the damper. Falling pressure at length closes the valve, pressure then passing from top to bottom of the piston, which allows the weight to settle and open the damper.

This Regulator is guaranteed to change the damper in either direction on a minimum variation of pressure. It is also guaranteed a fuel saver over the vast hand regulation.



IMPROVED DAMPER REGULATOR

Sizes:

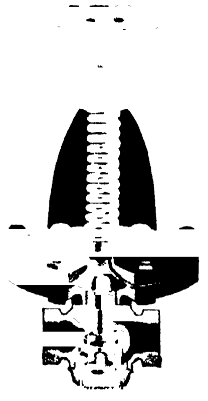
No. 1 up to 40" diam. damper
No. 2 " " 60" " "
No. 3 " " 72" " "

CURTIS WATER PRESSURE REGULATOR

For pulp and paper mills, hotels, public buildings and residences.

Warranted to maintain the pressure desired with perfect uniformity, in spite of any and all fluctuations in the outside pressure. This Regulator obviates the wear and tear caused by water hammer and high pressure on all plumbing fixtures and fittings.

Sizes: ½" to 12" inclusive.



CURTIS WATER PRESSURE REGULATOR

THE WELDED STEEL BARREL CORPORATION

Successors to

THE DETROIT HEATING & LIGHTING CO.

Manufacturers of

Detroit Combination Gas Machine with Automatic Mixing Regulator

DETROIT, MICH. Established 1868

PRODUCTS: Combination gas machine with automatic mixing regulators, fuel gas plants, laboratory burners, blast burners, tinners' gas fire pots, etc.

THE DETROIT COMBINATION GAS MACHINE AUTOMATICALLY MAKES GAS FOR LABORATORY AND INDUSTRIAL USES OF EVERY CHARACTER.

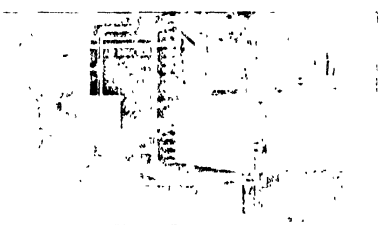
(OVER 40,000 IN DAILY USE)

Entered in ("Class A") the highest class by the National Board of Fire Underwriters.

Not a drop of gasoline brought into the buildings—it is all stored and generated in outside underground carburetor.

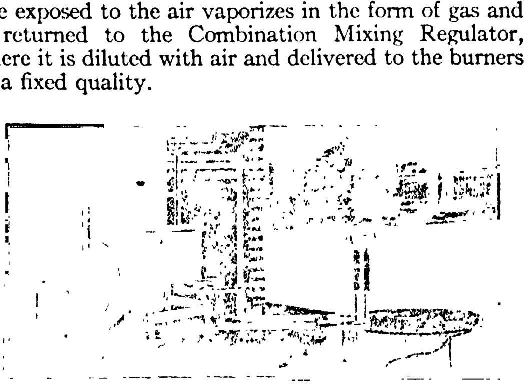
DESCRIPTION:

This is a very simple machine, comprising an Air Blower (either in the Weight or Water Driven Type), an Automatic Mixing Regulator which is usually located in the basement of the building, and a Carburetor or Generator which also serves as a Storage Tank, and is usually located about 30 feet from the building and buried underground.



WEIGHT DRIVEN TYPE

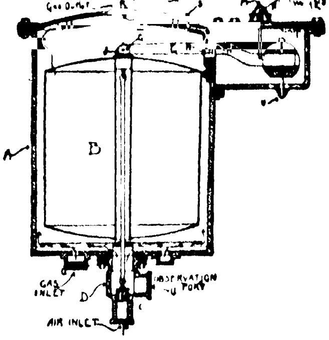
This Plant uses Gasoline as fuel. By observing the illustrations of the machine you will notice the Air Blower, which is either Weight Driven or Water Driven, takes air from outside and forces it through the Carburetor or Generator where it passes over the surface of the gasoline in the various Cells, two, three or more, depending upon capacity of machine—the gasoline exposed to the air vaporizes in the form of gas and is returned to the Combination Mixing Regulator, where it is diluted with air and delivered to the burners n a fixed quality.



WATER DRIVEN TYPE

The Weight and Water Driven Machine differs only in respect to Air Blower. The Weight Type requires an occasional winding, the Water Driven requires no attention at all—it is automatic.

THE COMBINATION MIXING REGULATOR APPLYING NATURE'S LAW OF BUOYANCY:



Combination Automatic Mixing Regulator

This law is applied in a very simple way in the Detroit Combination Mixing Regulator, a device fully covered by patents—AN EXCLUSIVE FEATURE ON COMBINATION GAS MACHINES The Regulator consists of a substantial cast iron case (A in the illustration) with the opening (P) at the bottom to let in air, and another opening at the top (R) to let out the gas Inside of this case is a cylindrical vessel (B), which is filled with air and is sealed air tight. This vessel is suspended from one end of a beam (E), on the other end of which is a weight (F), which exactly counterbalances the vessel. The balance beam, with the vessel and weight, is placed on the agate bearing (K), and as they exactly balance each other, their weight can be disregarded

That's a very simple arrangement, isn't it? Now, how does the law of buoyancy operate it? When the iron case becomes filled with a gas heavier than air, the vessel (B) inside will rise, just as the balloon rises in the heavier atmosphere, for the air in the vessel is lighter, volume for volume, than the heavier gas which surrounds it.

The gas which enters the case comes from the carburetor through the gas inlet (Q) in the bottom. This gas is charged with gasoline vapor and of course is heavier than air not so charged. The fresher the gasoline the more vapor will be absorbed by air passing over it. If this rich gas is allowed to reach the burners it will cause dense smoke and a disgusting odor. **The gas at the burners must be about 85% air and 15% gasoline vapor. Those proportions are permanent, as the Combination Mixing Regulator is permanently set when installed to mix about 85% air and 15% gasoline vapor.**

When the heavy gas comes into the case, the inner vessel filled with air immediately rises, bringing with it the valve C, which admits uncharged air through the inlet P. This at once reduces the richness of the gas and brings it to the quality for which the mixer is set. **The result is a gas of perfect mixture, producing the highest efficiency for every purpose where public gas would be used and at no greater cost.**

These plants when shipped are all set up ready to connect to the piping, so that any man having tools for cutting and threading pipe can make the installation very easily by simply following the printed instructions which accompany plant.

CAPACITIES AND SHIPPING WEIGHTS

Capacity Number of Burners or Lights	Diameter Carburetor Pit	Shipping Weights: Either Weight or Water Driven Type
15—	66″	930
20—	75″	1110
30—	78″	1185
40—	84″	1480
50—	90″	1520
75—	96″	2125
100—	102″	2715
150—	108″	3250
200—	114″	3425
300—	126″	4500
500—	132″	5250

Prices quoted upon application.

"Detroit" Laboratory Bunsen Burner

"DETROIT" LABORATORY BURNER:

The "DETROIT" Laboratory Burner has come into universal use for Laboratory work ot nearly every character. The separate control of both Air and Gas offers a wide range of temperatures with the greatest ease. Constructed of all brass except the base, which is iron and neatly japanned.

PRICES	Lots of less than one dozen	$1.25 each
	Lots of one dozen	10% Discount
	Lots of 12 dozen	20% Discount

DETROIT RANGE BOILER & STEEL BARREL CO.

Manufacturers of "Perfect" Metal Bilge Barrels and Detroit Drums

DETROIT, MICH.

BRANCHES
New York 30 Church St St Louis 706 Security Bldg
Chicago 642 McCormick Bldg Philadelphia 4802 Springfield Ave
San Francisco 68 Post St

MAIN OFFICE
2475 24th Street
Detroit, Mich

PLANTS
Detroit Michigan
Toledo, Ohio

PRODUCTS

"Perfect" Metal Bilge Barrels
"Detroit" Drums

"PERFECT" METAL BILGE BARREL

The production of steel barrels in the bilge shape is the one outstanding improvement in metal containers since their inception.

The Bilge Shape gives greater strength and durability. It is also responsible for the easier handling qualities of this type of package.

Representative users of **Perfect** Metal Bilge Barrels who formerly used wood barrels have reported savings, since they started shipping in **Perfect** Barrels of from sixty cents to three dollars per barrel of their product shipped. Think what it would mean in your business to save even fifty cents, or one dollar on every barrel of your product that you ship. These reports are available to anyone who cares to write for them.

"PERFECT" METAL BILGE BARREL
Black or Galvanized

Guarantee—So great is the faith of the maker that all **Perfect** Metal Bilge Barrels are guaranteed for three years from the date of shipment. We agree to repair or replace, free of charge, f.o.b. Detroit, any **Perfect** Barrel returned to us within three years of date of shipment, which shows under ordinary usage any defect in material or workmanship.

Perfect Barrels are further guaranteed as follows: That every barrel is tight under 15 lbs air pressure and will withstand a hydraulic pressure of 45 lbs. without permanent deformation; that every Barrel will meet the requirements of the Interstate Commerce Commission Specifications No. 5.

SPECIFICATIONS

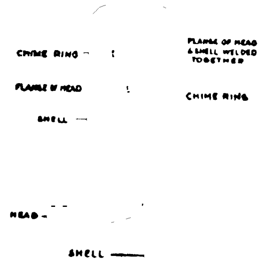
Material—Finest open hearth steel—12, 13 and 14 gauge—made to a special formula to secure uniformity of thickness and quality throughout

Dimensions—30 gallon: 29 inches high, 17 inches diameter at chime, 20 inches diameter at bilge

55 gallon 33 inches high, 20½ inches diameter at chime, 24½ inches diameter at bilge

Chime—The vital point in a steel barrel is its chime. It is upon the chime that the hardest blows fall and the greatest strain comes. On it 90% of the drops occur.

We have made the **Perfect** chime many times stronger than absolutely necessary. We could build a barrel for competition and save 10% on our chime construction alone. But we are making the strongest barrel we can make and our chime is the strongest part of a strong barrel



CROSS SECTION OF PERFECT CHIME

Galvanizing We use only pure zinc spelter in coating our galvanized Barrels and Drums immersing them in a tank of molten metal. Drums and Barrels are carefully prepared before immersion by scientific pickling process. Our galvanized Barrels and Drums are thoroughly and heavily coated and are absolutely clean on the inside

Testing—Every barrel, before shipment, is twice tested with air to 20 pounds pressure

REMOVABLE HEAD BARREL—

Perfect Barrels can be supplied with full removable head. This type is ideal for the shipment of powders, solids, semi-solids, pastes and other materials that cannot be put into or taken out of the ordinary package. This package is also well suited to carrying heavy, viscous liquids that make the inside of the ordinary barrel hard to clean.

The heads are absolutely tight. They are equipped with handles and secured in position or loosened by a half turn of the lugs.

"PERFECT" METAL BILGE BARREL
Removable Head

DETROIT DRUMS

Detroit Heavy Steel Drums—Detroit heavy steel drums are made in 55 gallon and 110 gallon capacities. The smaller sizes are made from 14 and 16 gauge material, the large from 14 to 12 gauge material. These drums are equipped with the **Perfect** chime and can be had with I-Bar or corrugated rolling hoops, in black or galvanized.

Detroit Light Steel Drums—Detroit light steel drums are made in 10, 15, 30, 50 and 55 gallon capacities. Up to and including the 30 gallon size the Light Drums are made from 19 gauge material. Fifty and fifty-five gallon sizes are made from 18 gauge material. They can be had painted black or in special colors. Reversible faucets furnished on request.

CATALOGS

A complete catalog of Barrels and Drums will be sent to any user on request. Given the necessary information we will analyze your shipping problems and give you definite recommendations as to the type of package best suited to your needs.

DIAMOND STATE FIBRE COMPANY

BRIDGEPORT (NEAR PHILADELPHIA), PA.

OFFICES IN PRINCIPAL CITIES

BRANCH FACTORY AND WAREHOUSE CHICAGO   IN CANADA DIAMOND STATE FIBRE CO. OF CANADA LTD. TORONTO

PRODUCTS

Producers of Diamond Fibre in sheets, rods and tubes for general manufacturing purposes.

Makers of Trunk Fibre.

Railroad and Signal Insulation.

Disfico Insulation.

Diamond Fibre Receptacles—trucks, roving cans, waste baskets and fibre containers of all kinds.

Diamond-F Protective Papers for wrapping pharmaceuticals, cosmetics, and other specialties.

Condensite-Celoron a waterproof fibre.

DIAMOND FIBRE

Our basic product is a tough, homogeneous material almost as hard as iron yet lighter than aluminum. It will take any machining process or may be bent and formed. It combines great tensile, compressive, shearing and dielectric strengths. It is made in standard colors, red, gray or black, and supplied in standard sheets, rods and tubes of various standard thickness and size.

TECHNICAL DATA

Tensile strength—Longitudinal 12,200 pounds, transverse 8,100 pounds, to the square inch

Compressive strength—Perpendicular to laminations 25,120 lbs., parallel to laminations 9,240 lbs per square inch

Shearing strength—1/8 inch fibre 10,920 lbs per square inch

Dielectric strength—Approximately 200 volts per mil

Specific gravity—1.38.

Uses—Especially adapted for manufacture of electrical and mechanical equipment, machined parts, bushings, gaskets, washers automotive parts, conduits, handles, pulleys, etc.

CONDENSITE-CELORON

This is a special grade of waterproof fibre designed for use where extreme resistance to water and high dielectric properties are essential. The material is absolutely non-hygroscopic and will not absorb moisture from the atmosphere regardless of the humidity.

Uses—Condensite-Celoron is especially recommended for radio and wireless work both as a superior insulating material and for making panels, bases, cleats, conduits, handles and other parts of high grade electrical equipment. It is made in two colors, natural (brown) and black. Supplied in sheets, rods and tubes of standard dimensions.

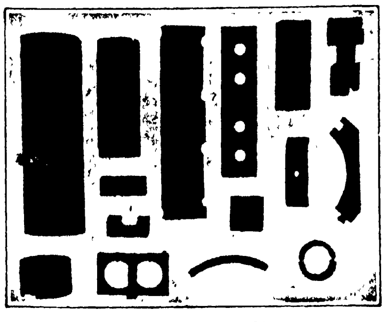
CONDENSITE-CELORON FOR SILENT GEARS

This particular grade is made especially for silent gear cutting.

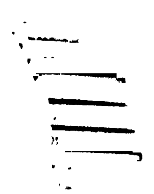
It is extremely water-resistant, high in dielectric strength, impervious to oils and most acids, highly resilient and self-supporting. Gears made of it, in standard size, require no shrouds or end plates. It is as strong as cast iron and when properly applied and lubricated will often outlast cast iron or brass gears. It can be used for duties in places and under conditions where the average non-metallic gear would be impossible.

Condensite-Celoron for gears is supplied in standard size sheets 36x36 and 36x40 in any thickness up to and including 3 inches. Write for samples and booklets.

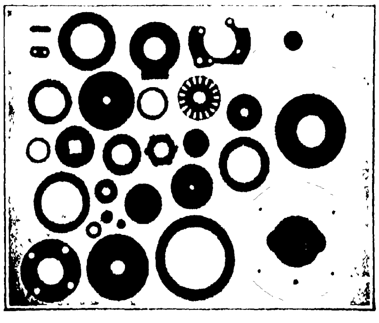
For the convenience of our western customers we maintain complete stocks and machining facilities at our western branch factory and warehouse, Chicago.



DIAMOND FIBRE
ELECTRICAL PARTS



CONDENSITE-CELORON
SPUR GEAR



DIAMOND FIBRE DISCS,
WASHERS AND PUNCHINGS

J P. DEVINE COMPANY

MAIN OFFICE AND WORKS
1376 CLINTON ST., BUFFALO, N. Y.
NEW YORK OFFICE: 50 E. 42nd St. HAVANA LONDON: James Livingston, Ltd.

PRODUCTS

- **Vacuum Chamber Dryers, Steam or Electrically Heated**
- **Vacuum Single and Double Drum Dryers**
- **Atmospheric Single and Double Drum Dryers**
- **Vacuum and Atmospheric Rotary Dryers**
- **Vacuum Drying and Impregnating Apparatus**
- **Vacuum Evaporators, Single and Multiple Effects**
- **Condensers—Surface, Jet and Barometric Types**
- **Vacuum Pumps, Wet and Dry Types**
- **Chemical Apparatus—Kettles, Stills, Columns, Caustic Pots**
- **Extractors, Autoclaves**
- **Solvent-Recovery Apparatus**
- **Grinders.**

VACUUM CHAMBER DRYERS

Used where the material can be spread out on plates or trays. Devine Chambers are made in all sizes and built for steam, hot water heating or electric heating. Materials which are being successfully dried in our Chambers: Dyes, Fruits, Vegetables, Fish, Nuts, Soap, Paste, Rubber, Sugar, Explosives, Fabrics, etc.

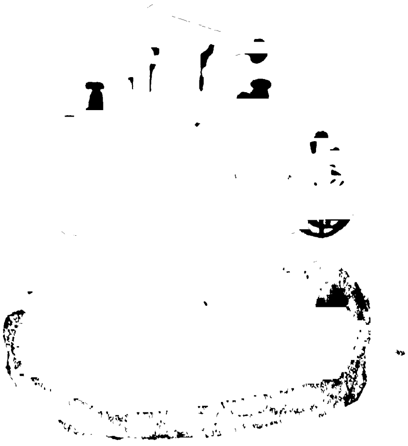
VACUUM CHAMBER DRYER

DRUM DRYERS

Are built in all sizes both vacuum and atmospheric and with Single or Double Drums. They are built for drying liquids containing solids and recover the solid as a finely divided powder.

THE DOUBLE DRUM DRYER

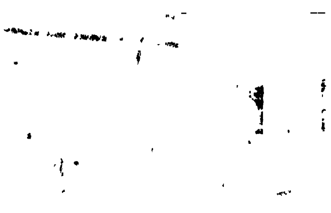
Drum Dryers are particularly designed to handle such substances as Milk, Blood Serum, Glue, Dyes, Intermediate, Logwood Extracts, Salt Solutions, and similar materials.



DRUM DRYER

ROTARY DRYERS

Are made in all sizes and are either vacuum or atmospheric type, depending on the work to be done. Like the preceding dryer they are steam heated, but they are provided with both an external jacket and an internal heating element. The internal heating element has also a series of blades which tumble the material to be dried. This apparatus is adapted to materials that do not coat the heating surface and can be tumbled without injury, such as Starch, Powdered Coal, Sawdust, Corn, Oats, Distillery Grains, Guano, Artificial Manure, etc.



VACUUM ROTARY DRYER

The operation of the Vacuum Chamber Dryer and the Vacuum Rotary Dryer is of necessity periodic, as the apparatus to guarantee feeding and discharge while maintaining a vacuum is too expensive and complicated to permit its being used successfully. However, the time required for discharging and charging is very small.

The Atmospheric Drum Dryers and Rotary Dryers and the Vacuum Drum Dryers are all continuous and the product can be carefully regulated at all times.

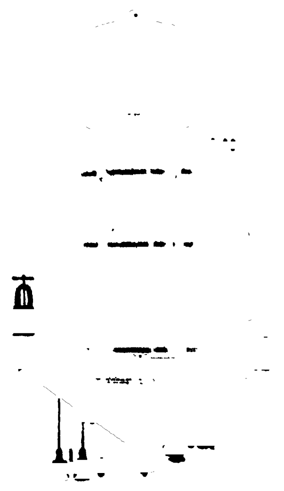
We supply all auxiliaries for the operation of this apparatus, such as Condenser, Catchalls, Dust Filters, etc.

EVAPORATORS

Built in any number of effects and of every design. We build Evaporators for evaporating all types of liquids or solutions, such as Sugar, Glue, Caustic Liquors, Salt Liquors, Waste Waters, Tannin Extracts, etc. Devine Evaporators are built of any material required by the nature of the liquors, such as iron, steel, copper, etc., or are copper tinned or lead sheathed for any work required.

VACUUM PANS

Furnished for all varieties of work and to handle all types of material. For the drug, sugar, and food industries.



VACUUM PAN

Continued on Next Page

DIAMOND STATE FIBRE COMPANY

BRIDGEPORT (NEAR PHILADELPHIA), PA.

OFFICES IN PRINCIPAL CITIES

BRANCH FACTORY AND WAREHOUSE CHICAGO IN CANADA DIAMOND STATE FIBRE CO OF CANADA LTD, TORONTO

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Diamond-F Protective Papers for wrapping pharmaceuticals, cosmetics, and other specialties.

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Shearing strength—⅛ inch fibre 10,920 lbs per square inch

Dielectric strength—Approximately 200 volts per mil

Specific gravity—1.38.

Uses—Especially adapted for manufacture of electrical and mechanical equipment, machined parts, bushings, gaskets, washers automotive parts, conduits, handles, pulleys, etc.

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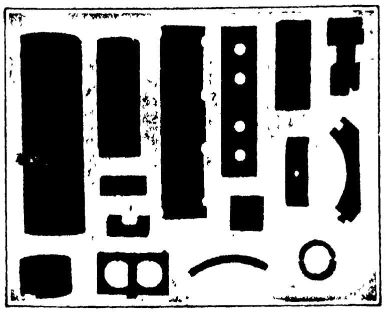
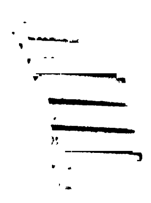
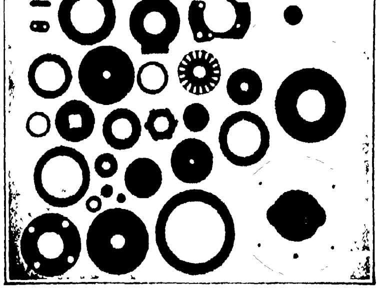


DIAMOND FIBRE
ELECTRICAL PARTS



CONDENSITE-CELORON
SPUR GEAR



DIAMOND FIBRE DISCS,
WASHERS AND PUNCHINGS

DINGS MAGNETIC SEPARATOR COMPANY

Dings and Wetherill High Intensity Magnetic Separators

HOME OFFICE AND WORKS
222 SMITH STREET, MILWAUKEE, WIS.

BRANCHES

New York
52 Vanderbilt Ave

Detroit
805 Hammond Bldg

Denver
1718 California St

Richmond
905 Fourth Ave

PRODUCTS AND SERVICE

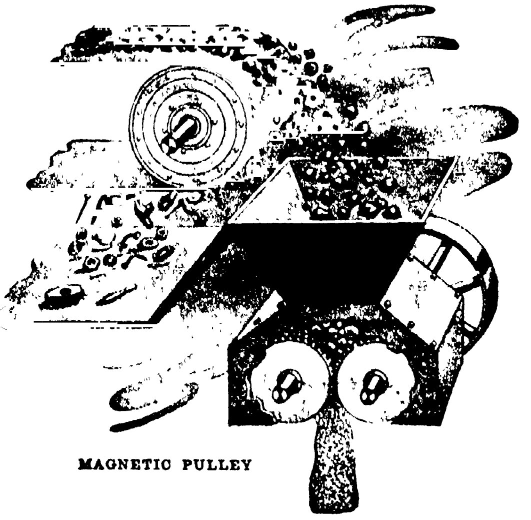
Magnetic Pulleys, Magnetic Separators, High Intensity Magnetic Separators, Magnetic Ore Concentrators, Spout Magnets, Safety Magnets, Metal Separators, Crusher Protectors, Standard and Special Magnets for all Purposes.

Magnetic Separator Service based upon many years' experience in this line. Estimates, sketches, processes, etc., cheerfully furnished.

MAGNETIC PULLEYS

Dings Magnetic Pulleys are made in all diameters and belt widths and are used in a variety of Industries for Protecting Crushing and Grinding Machinery.

With these Magnetic Pulleys as Head Pulleys in a belt conveyor all Tramp Iron is automatically removed from Conveyed Material before going into Crusher or Grinder.



MAGNETIC PULLEY

Magnetic Pulley Type Separators are very often used for simple Concentrating and Refining Problems.

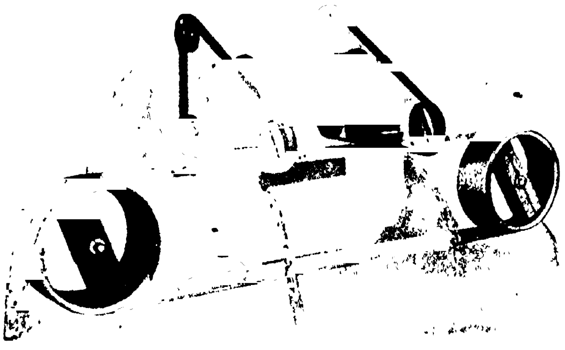
MAGNETIC SEPARATORS

There is a Standard Type of Dings Magnetic Separator for practically every separation problem encountered in Manufacturing, Mining, Concentrating, Reclaiming and Refining Plants. The following industries have applied Magnetic Separators to the solution of their problems:

Brass, Aluminum, Bronze, Gray Iron, Steel and Malleable Iron Foundries, Brass and Aluminum Smelters and Refiners, Brass and Copper Rolling Mills, Coal Mines and Crushing Plants, Rubber, Abrasive, Garbage and Crucible Reclaimers, Potteries and Fertilizer Plants. Mineral Concentrators of various ferrous minerals.

MAGNETIC ORE CONCENTRATORS

We manufacture Dings and Wetherill High Intensity Ore Concentrators in both Dry and Wet Types. All ferrous Minerals, whether Oxides, Sulphides or Arsenical, are susceptible to Magnetic Concentration. Such ores as Lead and Zinc Sulphide, Zinc Carbonate, Chromite, Barytes, Hubernite, Marcacite, Stannite, Almandite, Monazite, Wolframite, Hematite, Pyrrhotite, Ilmenite, Zircon, Andradite, Arsenopyrite, Sheelite, Manganese, Cassiterite, Magnetite, Pyrite, Nickel, Garnet, and Chalcopyrite, are particularly susceptible to Magnetic treatment.



WETHERILL SEPARATORS

COST PER TON

Because Magnetic Concentration produces such an extremely high recovery the cost per ton of Concentrates is usually considerably lower in a Magnetic Concentration Plant than in any other process.

Recoveries over 98% are not uncommon.

LABORATORY TESTS

We maintain a Laboratory in Milwaukee for testing materials in order to determine their susceptibility to Magnetic treatment. Samples are separated free of charge, and products returned to customers for analysis and inspection. A five pound sample is sufficient for this test.

GUARANTY

All Dings Magnetic Separators are guaranteed against Mechanical defects for a period of one year.

BULLETINS

Bulletins giving detailed information covering Standard Types of Magnetic Separators gladly mailed upon request.

FACILITIES

We carry certain Standard Types and sizes of Magnetic Pulleys and Magnetic Separators in Stock at all times. We are prepared to design and build Magnetic Separators for every kind of service to which such Machines are adapted. We are also in a position to design and furnish complete Magnetic Mills for Concentrating Minerals.

DOVER BOILER WORKS

Manufacturers, Engineers, Contractors of Steel Plate Construction

60 CHURCH STREET, NEW YORK, N. Y.

WORKS Dover, N. J Phones 1294 1295 CORTLANDT

PRODUCTS

Steel Plate Construction of Every Description including: Tanks for the Storage of Water, Acids, Oils, Tar, Asphalt, Gasoline, Molasses, and all Other Liquids; Compressed Air Tanks; Vacuum Tanks; Dissolving Tanks; Heating Tanks, etc.; Stacks; Flues; Penstocks; Flumes, Riveted Pipe; Chutes; Hoppers, etc.; Bins for the Storage of Ores, Lime, Coal, Chemicals, etc.; Stills, Dryers, Digestors, Agitators, Crystallizing Pans, Char Filters, Scrubbing Towers, Condensers, and all Kinds of Riveted Steel and Iron Equipment for Industrial Chemical Plants; also Welded Steel Plate Construction.

FACILITIES

Our plant is situated at Dover, N. J., on the main line of the D., L. & W. Railroad, only 40 miles from the port of New York. Being thus conveniently located and having ample facilities for making shipments, we are able to make prompt deliveries to points in practically every part of the country.

Our plant is modern and efficient and completely equipped for turning out the kind of work in which we specialize.

SERVICE

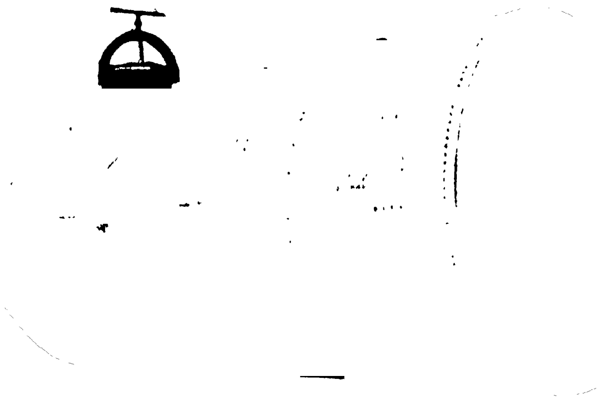
Our organization is composed of engineers and workmen who have had a long period of successful experience in designing and constructing steel plate equipment. We prefer to work from blue-prints furnished by our customers. When necessary, however, we will submit designs for equipment based on rough sketches submitted us by engineers or plant superintendents.

All of our equipment is subjected to rigorous inspection before leaving the factory, and the tests are made sufficiently severe to insure the apparatus meeting the local conditions under which it will be working when used by the customer.

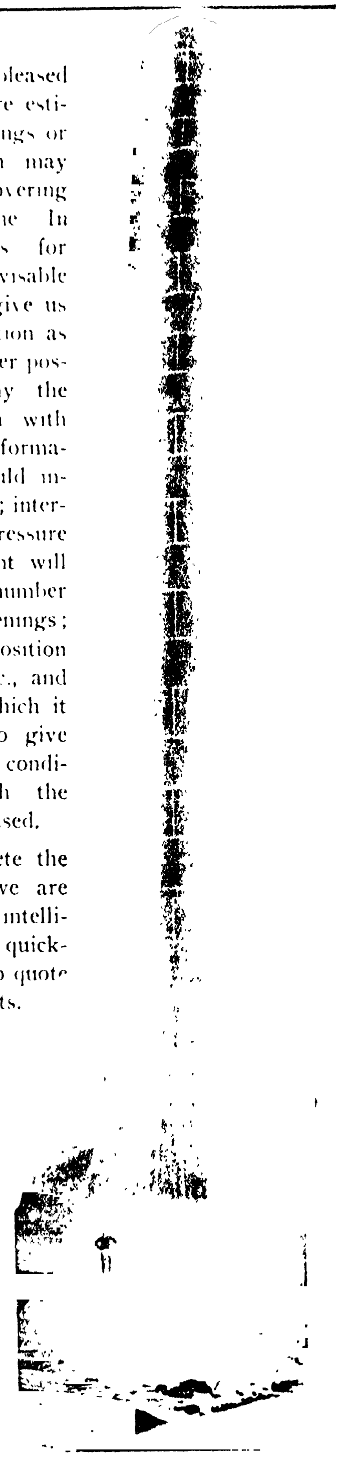
INQUIRIES

We are always pleased to quote and prepare estimates on any drawings or specifications which may be submitted to us covering any work in our line. In submitting requests for quotations it is advisable to avoid delay, to give us as detailed information as possible and wherever possible to accompany the written information with drawings. The information submitted should include all dimensions; internal or external pressure which the equipment will have to withstand, number and sizes of openings; number, size and position of lugs, flanges, etc., and any further data which it may be possible to give with regard to the conditions under which the equipment will be used.

The more complete the data with which we are supplied the more intelligently and the more quickly we will be able to quote on your requirements.



HORIZONTAL STILL 10 FT. DIAM. x 30 FT. LONG



SELF-SUPPORTING STACK 250 FT. x 18 FT.

THE DORR COMPANY

Engineers

101 Park Avenue

NEW YORK, N. Y.

Cable Addresses
"DORRCLASS", New York
"DORR", Denver
"CYANDORMAC", London
Code Bentley

DENVER
1009 Seventeenth Street
LONDON
16 South Street

PRODUCTS

A complete line of apparatus for Classifying, Dewatering, Settling, Leaching, Washing and Agitating.

SERVICES

We are specialists in separation, sedimentation and dewatering as applied in the concentration of ores and in the treatment of trade waste and in special fields of chemical manufacture, with a wide range of experience and achievement.

Our laboratory and test plant at Westport, Conn., is devoted to the development of the constantly increasing applications of Dorr equipment and to research for clients in chemical, industrial and metallurgical problems. A capable technical staff is also available for the design or improvement of plants and the operating management of entire properties.

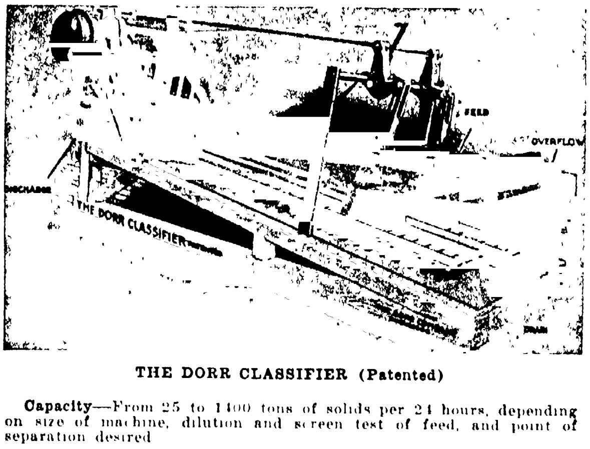
GENERAL APPLICATION

By means of Dorr apparatus many processes formerly intermittent can be made continuous, greatly reducing operating costs and labor requirements.

THE DORR CLASSIFIER

Built in two models, "C" and "D," consists of a settling tank in the form of an inclined trough open at the upper end. The feed enters near the center and the liquid and slow settling solids overflow at the closed end, while the sands or quick settling solids are conveyed along the bottom by mechanically operated reciprocating rakes and, after emerging above the liquid line, are discharged at the open end.

All parts moving on each other are suspended above the liquid so that wear is eliminated.



THE DORR CLASSIFIER (Patented)

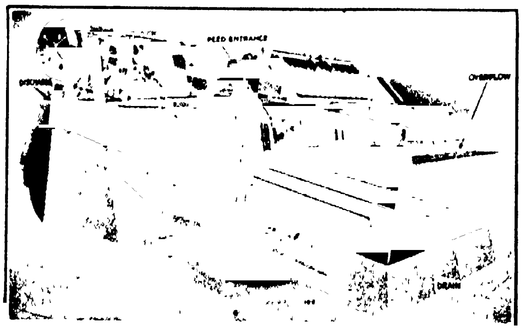
Capacity—From 25 to 1100 tons of solids per 24 hours, depending on size of machine, dilution and screen test of feed, and point of separation desired

Products—Will make a separation at from 28 to 200 mesh and deliver sand dry enough to be carried on belt conveyor. For finer separations see the Dorr Bowl Classifier.

Regulation—By means of baffles, sprays, speed of rakes, dilution, and amount of feed

Operating Cost—Power ¼ H. P. per 150 tons solids. Maintenance .02 to .05 cent per ton solids

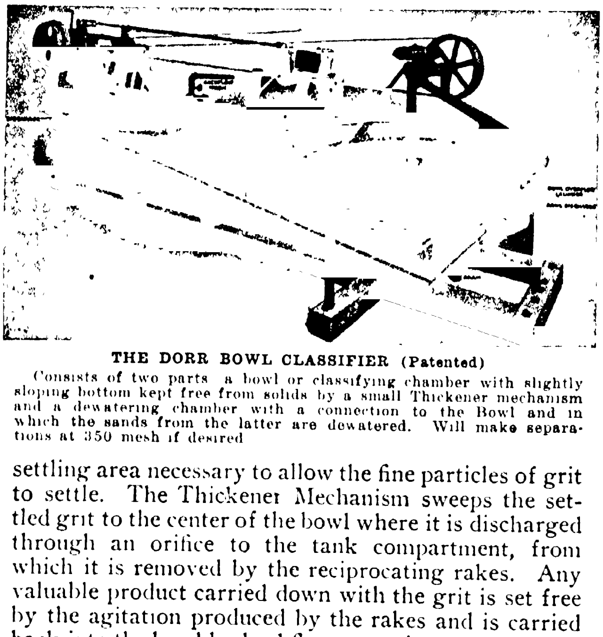
Uses—Dewatering any granular product. Separation of clay from sand. Closed circuit fine grinding of silica, paint pigments and solids of similar physical properties. Washing sand. Continuous production of milk of lime.



DORR CLASSIFIER, MODEL "D"

THE DORR BOWL CLASSIFIER

This machine is advocated for the production of fine floated products, such as paint pigment, which must be entirely free from grit. The Bowl gives the increased settling area necessary to allow the fine particles of grit to settle. The Thickener Mechanism sweeps the settled grit to the center of the bowl where it is discharged through an orifice to the tank compartment, from which it is removed by the reciprocating rakes. Any valuable product carried down with the grit is set free by the agitation produced by the rakes and is carried back into the bowl by backflow water introduced in the tank compartment. Thus a high recovery is obtained, the grit being discharged practically free from fines.



THE DORR BOWL CLASSIFIER (Patented)

Consists of two parts a bowl or classifying chamber with slightly sloping bottom kept free from solids by a small Thickener mechanism and a dewatering chamber with a connection to the Bowl and in which the sands from the latter are dewatered. Will make separations at 350 mesh if desired

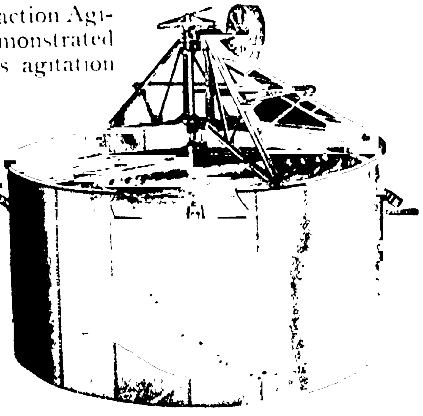
MULTI-DECK WASHING CLASSIFIER

This is in effect a series of Dorr Classifier tanks and rakes operated by a single driving mechanism and so arranged that the granular material is discharged from one into the next in the series, while the wash water flows in the opposite direction, thus effecting countercurrent washing. It is used for leaching granular or crystalline products and washing them free from dissolved materials.

Continued on Next Page

HE DORR REACTION AGITATOR

The Dorr Reaction Agitator is an agitation tank uipped with a mechanism consisting of a vertical air t which can be revolved by a shaft supported from e top of the tank and equipped with distributing unders above the liquid level and plow arms at the ottom which sweep the pulp to the center. This se- res uniform circulation and allows an intensity of gitation to suit the requirements of the material being eated. Means are provided for readily bringing the lp into suspension after a shut down and when neces- ry steam coils are set in the tank.

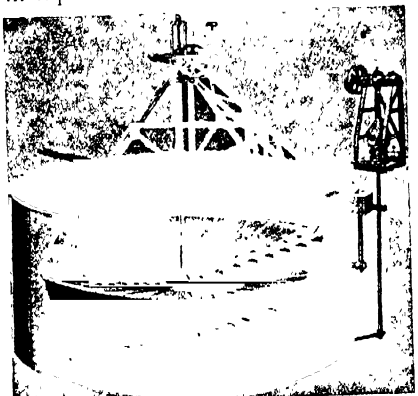


DORR REACTION AGITATOR (Patented)

The Dorr Reaction Agi- tor has demonstrated at continuous agitation ay be used o great advantage in any chem- cal opera- ions where t was for- nerly con- idered es- ential to work in atches. Causticizing Soda Ash with Lime is an example f this which, in practise, has resulted in a conversion f 93%, making a 15° Baumé solution, as compared with 92% in a 13° Baumé solution using batch agitation.

THE DORR THICKENER

Consists of a slow moving mechanism set in a tank or basin affording a means for the continuous settling and dewatering of finely divided solids carried in suspension in liquids.



DORR THICKENER (Patented)

The thickener mechanism is made up of radial arms attached to the lower end of a vertical shaft driven by a worm and worm gear. The arms carry plow blades set at an angle which, through the rotation of the mechanism, move the settled material to a discharge opening at or near the center of the tank. The feed enters continuously at the center of the tank, and the peripheral overflow trough collects the clear liquid.

The underflow, consisting of the thickened solids, is preferably controlled by a Dorrco Pump.

The Tray Thickener, of which several types have been developed, furnishes means of multiplying the settling capacity without increasing the floor space required. As many as three trays are in use in a single tank.

Capacity—Thickeners are in use in tanks from 6′ to 200′ diameter, handling from 2 tons to 3000 tons of solids daily

Applications—The Dorr Thickener is handling a wide range of products, from silicious material ground through forty mesh screens which can be discharged containing 30% to 40% moisture to precipitated ferric hydrate and the lightest of finely divided organic material, such as sewage, rubber wastes, etc

Where dilute pulps have to be filtered, prior thickening increases greatly the capacity of the filter and reduces the cost of treatment.

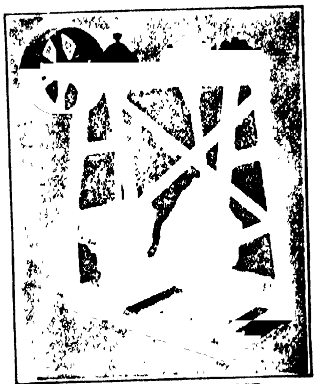
The Dorr Thickener is applicable in practically every case where settling and decantation is required.

CONTINUOUS COUNTER-CURRENT DECANTATION

Is a method of washing finely divided solids such as pulverized ore gangue, precipitates and similar materials, free from liquid containing dissolved materials in a series of settling tanks. The solids to be washed pass successively from tank to tank while the water or liquid used for washing flows in the opposite direction. The solids from each settling tank are diluted with liquid overflowing from subsequent units in the system, forming the feed to the following settling tank.

The Dorr Multideck Classifier or a series of Standard Classifiers is used for this purpose on material from 100 mesh to ½″ that will settle rapidly and can readily be raked above the liquid level. For washing finer materials which require a greater settling area a series of Thickeners is used with Dorrco Pumps to transfer the thickened product from one to the next.

THE DORRCO PUMP



THE "DORRCO" PUMP
(Pat. Applied for)

A self-contained Diaphragm Pump with flat valves, designed after long experience to give continuous operation and close control of Dorr Thickener under-flows with minimum repair costs. Pump bodies are made with one inch, two inch, three inch and four inch suctions and frames to carry from one to four bodies are in use. Adjustable eccentrics allow close regulation.

CONSTRUCTION

Where acid liquors are used or where discoloration of a product has to be considered, the principal submerged parts of the machines are made of wood or lead covered iron and steel, and the blades are made of Duriron, Glass, Stoneware, or Bronze.

BULLETINS

We issue numerous bulletins covering every phase of the design, construction and operation of our various machines and installations.

M. J. DOUGHERTY CO.

Piping Fabricators and Engineers

Factory and Main Office -25th Street and Washington Avenue
PHILADELPHIA, PA.

BRANCH OFFICES
25 West 43rd Street New York N Y
258 Candler Annex Atlanta Ga
1597 St Clair Avenue, Cleveland O
252 Jefferson Avenue W Detroit, Mich

PRODUCTS

Industrial Piping, High and Low Pressure, for Steam, Gases, Oils, Water, Acids, Alkalies, etc.

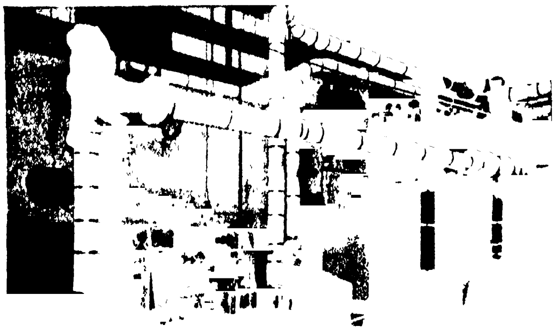
Pipe Bends, Welded Headers, Square-Lap Vanstone Flanged Joints, Fittings, Pipe, Valves.

Fabricated Pipe Work of any design.

SERVICES

The **Dougherty** product is fabricated in our new factory and can be installed in your plant by our erecting crews if it is so desired.

Having at our command equipment which is acknowledged to be the most modern and unique in the efficient development of the industry, we can offer you real quality at prices that are sure to be attractive.



COMPLETE POWER PLANT INSTALLATION

Complete piping contracts can be executed for Public Utilities, Central Stations and Power Plants for manufacturing purposes, Chemical Works, Paper and Pulp Mills, Rubber, Soap and Automobile Factories, Oil and Sugar Refineries, Cotton Oil, Silk and Textile Mills, Coal and Metal Mining Operations, Steel Plants and Fertilizer Works, Water Cooling Systems, and Waste Heat Boiler Installations for Cement Plants and allied industries.

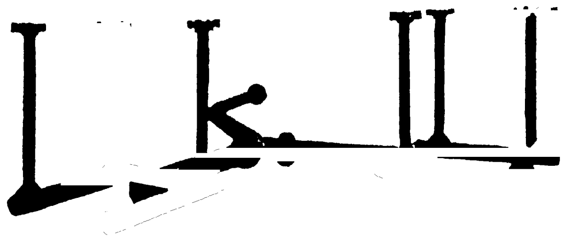
FACILITIES

We fabricate and erect complete, piping for all purposes, either to our own measurement and plans, in which case we take all responsibility, or according to blue prints to be submitted by you. Or, if it is so desired we will furnish materials only. Our erecting crews are stationed all over the country. Although we get a number of contracts from engineers and architects, we have one of the most efficient engineering departments in the piping industry.

A concern is known by the clients it serves and when repeat orders are secured, the value of the service rendered is obvious. Such a list of Dougherty served clients would include:

Edison Portland Cement Co
Merrimac Chemical Company
Virginia Carolina Chemical Co
Baldwin Locomotive Works

Savannah Sugar Refining Co
Raritan Copper Works
Imperial Tobacco Products Co
Hershey Chocolate Company



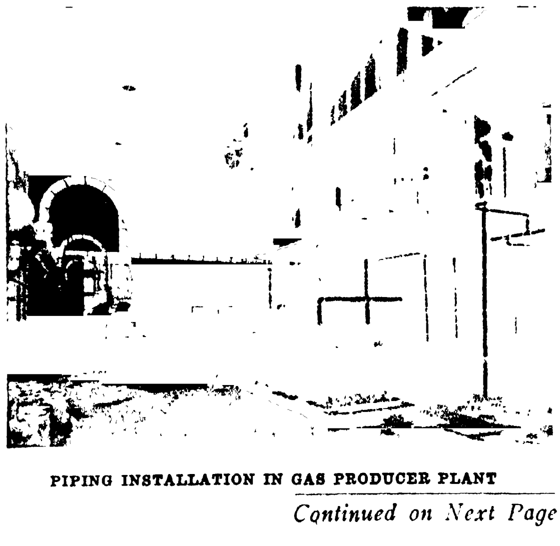
A SPECIALLY DESIGNED HEADER FOR CHEMICAL PURPOSES

The Electric Storage Battery Co
Victor Talking Machine Company
West Virginia Pulp & Paper Co
Tennessee Copper Company
Standard Silk Company
Mathieson Alkali Works
Asiatic Petroleum Company
Miami Copper Company

Bethlehem Steel Company
Standard Oil Company
Eastern Potash Company
Owens Bottle Company
New Jersey Zinc Company
Solar Refining Company
Caribbean Sugar Company
Lehigh Portland Cement Co

INDUSTRIAL PIPING, ITS IMPORTANCE TO EFFICIENT PLANT DESIGN

Until recently the power plant field has been a neglected study because of the comparative cheap cost of fuel. Too little consideration has, therefore, been given to the piping feature. Few executives realize the amount of piping involved in the modern industrial plant, the complexity of it, or the dependence placed upon it. A study of this problem is all the more necessary because of the present high cost of coal and other fuels.



PIPING INSTALLATION IN GAS PRODUCER PLANT

Continued on Next Page

Piping plays an essential part in most industrial plants. It is a vital factor in plant reliability and safety and the question of economy, not so much of original installation, but more so of maintenance is of paramount significance. Economy in first cost is "Penny wise and pound foolish" if the executive buys a service that is cheap as far as original price is concerned but expensive every day thereafter.

AIR CONDENSER PRESSURE STILL FOR AN OIL REFINERY

Piping for industrial purposes to convey either steam, water, air, oil or any other gases or liquids to various agencies is in every case a problem requiring the service of the highest type of engineering skill. Only by proper design, correct fabrication and erection can lastingly good piping be attained.

Modern practise is to select higher steam velocities by using smaller pipe and adopting superheat. This reduces original cost, lowers heat losses and effects highest plant efficiency.

13-TON ELBOW BEING MACHINED AND DRILLED FOR SQUARE LAP FLANGED CONNECTION

THE SQUARE LAP FLANGED JOINT

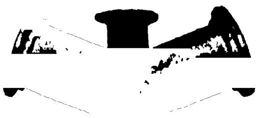
Leading engineers invariably will specify pipe flanged by the square lap (Vanstone) Joint, as it is made to suit all purposes of pipe line connections. The Dougherty improved system of manufacture is recognized as the ideal.

The Square Lap Flanged Joint is made by turning over the end of the pipe and facing off to insure even bearing of the gaskets. The flange is loose, thus saving the erector time in setting the bolt holes in place. The lap being rolled to the inside edge of the bolt holes, maximum bearing for gasket is obtained, and the water pocket eliminated. The lap is 75% heavier at the radius than the walls of the pipe, and machined on the face, edge and back.

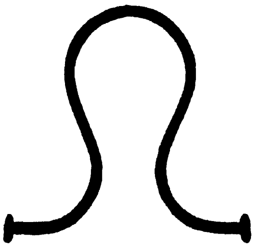
The Dougherty Square Lap Joint is made in the standard and extra heavy weight pipe, with high hub cast iron and semi-steel and forged steel high and low hub flange.

PIPE BENDS

The inauguration of high pressure boilers and engines has necessitated many marked improvements in the piping of steam plants. To allow for expansion and contraction, and to give flexibility in pipe lines, special bends are now a necessity. Our factory is equipped to bend pipe of any diameter to sketch and to fit it with screwed, welded or our improved square lap flange. Detailed tables of Quarter and U-bends will be furnished upon application, but Expansion and other special bends must be given special consideration.



WELDED HEADER



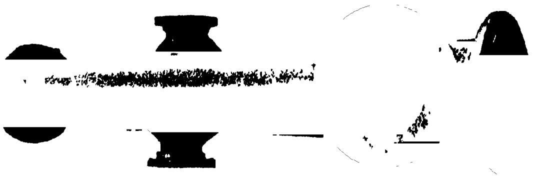
12 FT EXPANSION BEND

WELDED STEEL HEADERS

Steel headers with welded nozzles are recommended for severe service and superheated steam, as they reduce the number of joints under all steam, water or any other liquid conditions. They prevent leaky joints, and give as near one hundred per cent piping results as are possible. Welded headers save not only on original cost but more so on maintenance, for their use effects a lastingly tight connection.

A recent improvement inaugurated in all our header work is the reinforcing ribs on all nozzles of any length. They give added strength where this reinforcing is necessary.

Equipment of all welded headers with the square lap flange is recommended on all high pressure steam lines.



WELDED STEEL HEADER (Note reinforced necks)

For further information regarding our product and our facilities write our nearest office. Ask for Bulletin A-21.

Established 1876

Incorporated 1885

THE DOW CO.

Incorporated

Manufacturers of Gravity and Power Conveyors

1025-1251 Franklin Street
LOUISVILLE, KY.

NEW YORK OFFICE
50 Church St

DETROIT OFFICE
8855 Woodward Ave

CHICAGO OFFICE
1235 Old Colony Bldg

REPRESENTATIVES IN OTHER PRINCIPAL CITIES

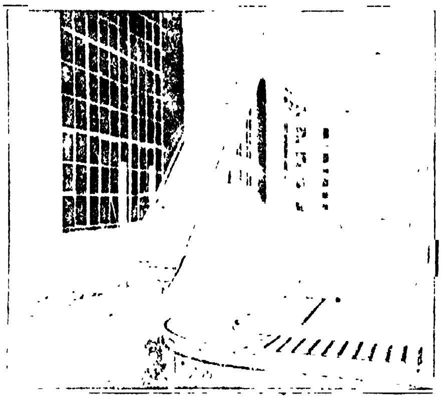
PRODUCTS

Gravity Roller Conveyors; Steel Spiral Chutes; Belt Conveyors; Portable Adjustable Elevators.

Also manufacturers of Apron Conveyors, Chain Conveyors, Slat Conveyors, Screw Conveyors, Bucket Elevators and Special Conveyors.

SERVICE

This company places at the disposal of engineers, architects and prospective users the services of a skilled Engineering Department experienced in all manner of conveying problems. There is no charge for drawings and detailed information covering individual conveying layouts.

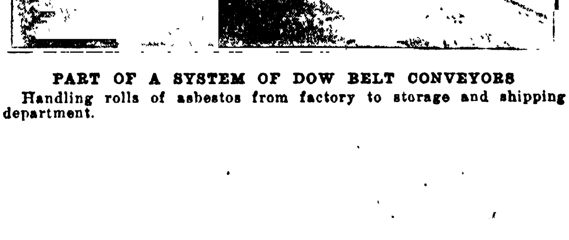


PART OF AN EXTENSIVE SYSTEM OF DOW CONVEYORS IN A BREWERY
Note the inclined elevator in the foreground and the two roller spirals in the background.

SCOPE OF USE

Dow Conveyors speed up production, eliminate expensive and uncertain labor and save valuable floor space.

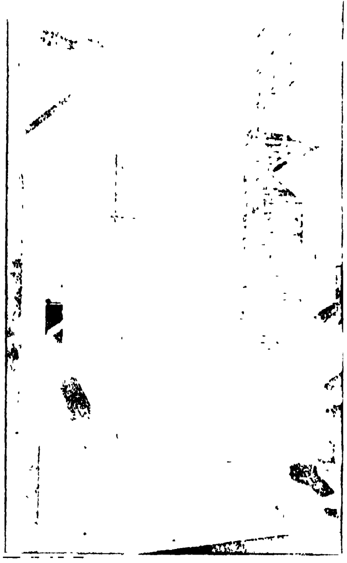
Used by factories, foundries, canning and packing plants, food product plants, oil refineries, bottling plants, munition plants—in fact, any place where quantities of materials or merchandise of any description must be handled from one place to another.



PART OF A SYSTEM OF DOW BELT CONVEYORS
Handling rolls of asbestos from factory to storage and shipping department.

GRAVITY CONVEYORS

Furnish the ideal means of handling materials and products wherever they can be used. A grade of 3% to 5%, depending upon the nature of the merchandise, is necessary for the operation of gravity conveyors. They require no power or attention of any kind.



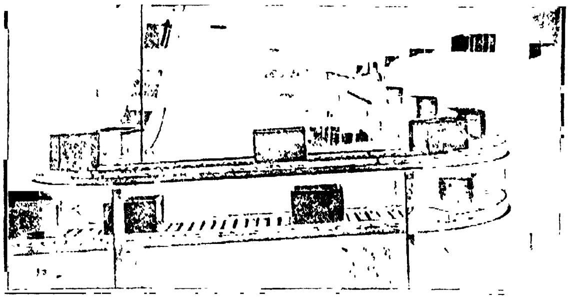
DOW BUCKET ELEVATORS AND SCREW CONVEYORS
Handling fuller's earth from filters to purifying retort and back to filters.

POWER CONVEYORS

Of all descriptions, usually designed to operate in conjunction with gravity conveyors.

ESTIMATES

In writing for estimates or other data, state dimensions and weights of largest and smallest packages and send drawing or sketch with dimensions indicating points between which goods must be handled.



DOUBLE DECK GRAVITY CONVEYORS HANDLING CASES
This arrangement effects a great saving in floor space where large capacity must be handled, or where two types of products must be handled simultaneously to different points.

DOWNINGTOWN IRON WORKS, INC.

Steel Tanks and General Plate Construction

OFFICE AND WORKS

DOWNINGTOWN, PA.

PRODUCTS

Steel Tanks of all descriptions for all purposes, Steel Smoke Stacks, Smoke Flues, Stills, Condensors, Vulcanizers, Ballast Tanks, Riveted Steel Pipe, Water Tube Boiler Drums, Waste Heat Boilers, Tender Tanks; in fact, practically everything of steel plate.

LOCATION

Our Plant is thirty-two miles from Philadelphia on the main line of the Pennsylvania Railroad and within seven miles of two of the largest plate mills in the East and within easy access of shape, bar and rivet manufacturers and Philadelphia warehouses, enabling us to obtain our raw materials promptly.

FACILITIES

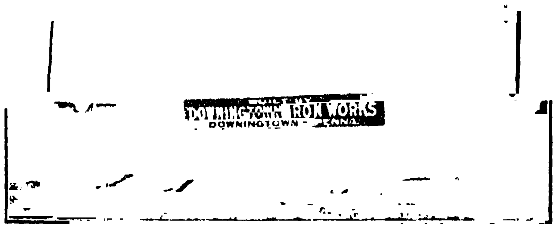
Railroads: Excellent railroad facilities

Welding: Electrically and by the Oxy-Acetylene Process.

Tools: Hydraulic Riveter, Hydraulic Press, Punches, Drills, Rolls, Shears, Planer; in fact, all up-to-date equipment for fabricating steel plate.

ORGANIZATION

Made up of men who have had from twelve to thirty years' experience in the construction of steel plate work.



TENDER TANK

PRESSURE TANKS

TANK STORAGE YARD

THE DRAPER MANUFACTURING CO.

Manufacturers of

Self-Recording Scientific Instruments

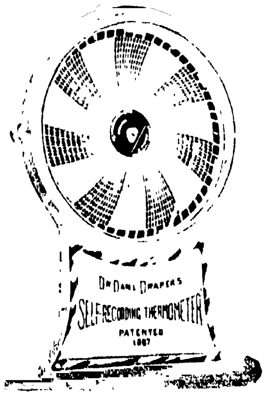
329 GREENWICH STREET, NEW YORK, N. Y.

PRODUCTS

Draper's Self-Recording Thermometer, Draper's Self-Recording Hygrometer, Draper's Self-Recording Rain Gauge, Draper's Self-Recording Barometer, Draper's Force of wind instrument, Draper's Anemoscope, Draper's Anemometer.

SERVICES

The Draper Mfg. Co. is in a position to supply the scientific instruments developed and patented from time to time by Dr. Daniel Draper, the scientist. Our force of skilled instrument makers have a complete knowledge of every working part of our instruments. We send these men out to set up these instruments, to make repairs when necessary, as well as to instruct operators in their proper maintenance.



SELF-RECORDING THERMOMETER

DRAPER'S SELF-RECORDING THERMOMETER

The thermometer gives a permanent and continuous record of the temperature.

In this instrument a clock revolves a disc, on which is placed a chart, indicating the hours of the day and days of the week, by radiating divisions, and gives the degrees of temperature, Fahrenheit scale, from 20 degrees below zero to 110 above, by concentric circular divisions.

DRAPER'S SELF-RECORDING BAROMETER

Draper's Self-Recording Barometer indicates and records accurately the barometric pressure. The time on the chart is divided into hour spaces, and the mercurial column measured to the hundredth of an inch. The glass tube is 36 inches in length, the upper portion being of larger diameter than the lower.

When the pressure of the atmosphere diminishes, a portion of the mercury flows out of the tube into the reservoir; this, becoming heavier, stretches the steel springs, causing the ink pencil fastened to them to mark downwards.

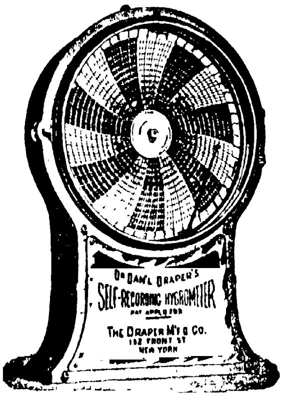
If the pressure increases, the reverse movement takes place. The record is made on the register, carried at the rate of half an inch per hour from right to left by the clock.

A special feature of our Self-Recording Barometer is the fact that our instrument is graduated to multiply three times. This enables the observer to note minute changes in atmospheric pressure that would not appear on the ordinary Barometer.

This instrument is used as a standard by leading Colleges, Universities, Observatories, and plants in this country and Europe

DRAPER'S SELF-RECORDING HYGROMETER

This instrument for measuring the amount of moisture or humidity in the atmosphere is built on accurate and scientific lines. It gives the measurements on a paper chart in percentages, 0 being dryness and 100, saturation. The chart makes one revolution per week. This instrument is applicable to every industrial use where an accurate and complete record must be kept throughout the year of atmospheric conditions and their effect on the products; such industrial plants as Textile and Food products, as well as Research Laboratories, Universities, Observatories, etc.



SELF RECORDING HYGROMETER

DRAPER'S SELF-RECORDING RAIN GAUGE, STATIONARY TYPE

This instrument has a special value to a number of industries, such as Water Works, Mills, Agricultural Stations and Manufacturers.

The gauge is raised about seven feet above the roof; the pipe in connection with the rain-gauge leads the water to a wedge-shaped gravity bucket. This is delicately balanced in a frame that hangs from long spiral springs, and whose motion, up and down, is directed by vertical tracks.

DRAPER'S SELF-RECORDING RAIN GAUGE, PORTABLE TYPE

This type has all the accuracy of the Stationary Type, but it has special features which make it particularly adaptable to certain requirements.

DUFF PATENTS COMPANY, INC.

Manufacturers of

Hand-Poked and Mechanical Producers

Sole Manufacturers of

Christie Dryers, Calciners, Roasters, and Coolers

OFFICE: FRICK BLDG., PITTSBURGH, PA.

WORKS: Behan St., North Side

PRODUCTS

Gas Producers, Christie Dryers, Calciners, Roasters and Coolers, Steel Tanks, Stacks, Steel Riveted Piping and all kinds of Heavy and Light Steel Plate Work.

APPLICATIONS

We have installed over 3000 of our Producers in the largest Iron, Steel, Glass, Chemical and Lime Plants in this country.

BRADLEY GAS PRODUCERS

The Bradley Gas Producer construction involves two slotted cone grates running parallel with the steel water pan and from wall to wall of the producer. Each of these grates is divided in the center by a steel plate. These dividing plates extend the full length of the grates and divide each of the grates into two equal parts. Each of the half grates is supplied by a separate and independent steam blower. The grates in the Bradley producer are so arranged that an even and equal distribution of the air and steam is obtained in all parts of the fuel bed, making the gasification of the coal uniform in all parts of the producer and thereby reducing to the lowest possible minimum the formation of clinker and the poking of the fires.

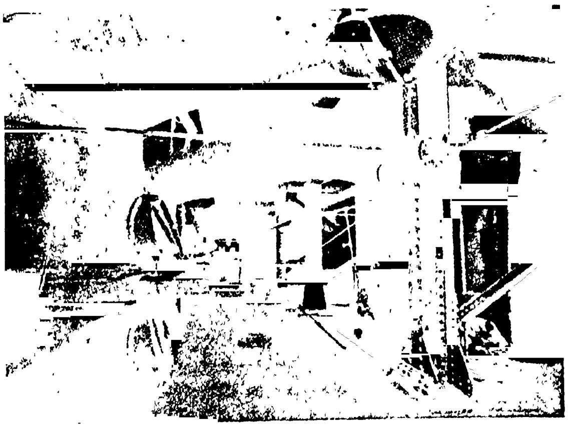
This producer is built in unit capacities of 12, 15 and 20 tons Pittsburgh run-of-mine coal per 24 hours.

Two men can operate four or five producers, when an overhead feeding arrangement is provided.

Where the coal is charged from the gas producer floor into the hoppers by hand labor two men operate three producers.

LIME PLANTS

Our system of burning lime with producer gas assures an even and equal burned lime, and an increased output for a given amount of coal.



PITTSBURGH PLATE GLASS COMPANY, FORD CITY, PA.
Hand-poked type

DRYER USING INDIRECT STEAM HEAT

We are the Sole Manufacturers of Direct, Semi-direct, Indirect and Steam Heat Dryers, Calciners, Roasters and Coolers as designed by the L. R. Christie Company of Pittsburgh, Pa.

SEMIDIRECT HEAT DRYER

SWANTON LIME CO, PLANT, SWANTON, VT

SOME OF OUR CLIENTS

National Tube Co., Lorain, Ohio
Brier Hill Steel Co, Youngstown, Ohio
Pittsburgh Plate Glass Co, Ford City, Pa.
Illinois Glass Co, Alton, Ill
Dominion Line Company, Sherbrooke, P. Q.
Allegheny Plate Glass Co, Glassmere, Pa.
American Bottle Co, Streator, Ill
Youngstown Sheet & Tube Co., Youngstown, Ohio
Swanton Lime Co., Swanton, Vt.
National Mortar & Supply Co., Gibsonburg, Ohio

DRYING SYSTEMS, INC.

Designers and Builders of Drying and Conditioning Apparatus

11 S. Desplaines St.
CHICAGO, ILL.

PRODUCTS

Drying Apparatus for:
- **Chemical, Biological and Pharmaceutical Products.**
- **Milk, Eggs, Malt, Fruit Juices.**
- **Aniline Dyes and Dry Colors, Fruits, Vegetables and Other Food Products.**
- **Paint, Varnish, Enamel and Japan.**
- **Glued-up, Veneered, and Dimensioned Stock.**
- **Leather, Rubber, Textiles, Tobacco, etc.**

Complete Industrial Air Conditioning Systems.
Air Washers and Humidifiers.
Trucks, Trays, Pans, and other Dryroom accessories.

FEATURE

An important feature of our drying process, making it particularly desirable for all classes of atmospheric drying, is that the apparatus itself is an independent unit located outside of the drying chamber. This makes it possible to use the apparatus in conjunction with a chamber or tunnel of any size or shape, or even to use one apparatus for a series of chambers or tunnels.

This means that you can buy standardized equipment from us, which obviously can be furnished for less money, and in shorter space of time than specially designed equipment and your drying chambers or tunnels, together with conveyors, trucks and other accessories can be built to meet your particular requirements.

If you have any new drying problems or any old unsolved ones, it will not entail any obligation on your part to submit them to our Engineering Department for consideration.

TUNNEL TYPE DRYER

The apparatus pictured in Plate No. 1 is our new tunnel type drying apparatus. This machine is designed to handle any product which is susceptible to drying on wire mesh or wooden slat trays, but is especially desirable when the product can be handled on wooden slat trays, because this will make it possible to operate the apparatus in conjunction with our reversible and interlocking trays, and our automatic dumping device (Patents pending).

The tunnel type machine is available in single units having drying space for from 3 to 8 trucks, and in multiple units having space for from 6 to 48 trucks.

A standard truck-load of wire mesh trays consists of sixty 36″ x 42″ trays, totaling 630 square feet of tray surface per truck; and a standard truck-load of wooden slat trays consists of twenty-seven 42″ x 72″ trays, totaling 520 square feet of tray surface.

The operating cycle of the tunnel type machine (patent pending) used in conjunction with our wooden slat trays and dumping device, is as follows. The material to be dried is spread on trays, either by hand or mechanically. Twenty-six trays are then stacked one above the other, on the bottom tray, which is equipped with truck wheels, whereupon the truck load is ready for drying. The door is opened, the truck pushed into the tunnel, a conveyor engages it and moves it forward one full truck length Succeeding trucks follow the first, each being moved forward one full truck length by the conveyor, until the entire tunnel is filled After this, whenever a new truck is ready for drying, a dry truck is ready to be pulled out at the far end As soon as a dry truck has been removed from the tunnel, it is transferred to the automatic dumping device where the entire load of dry product is dumped into storage bins in one operation, requiring less time to do this than is generally required to unload a single tray In order to prevent all possibility of a dusting of the dry product the dumping device is entirely enclosed. After dumping, the empty truck is immediately returned for reloading, which means that the original truck equipment need only be one or two in excess of those actually in the tunnel, and also means that there will never be any idle trucks occupying valuable factory floor space.

COMPARTMENT TYPE DRYER

The apparatus pictured in Plate No. 2 is our improved compartment type drying apparatus, and is designed to handle any product which is susceptible to drying on trays or in pans, and is available in any desired size frem one to twenty compartments.

Each compartment is built large enough to hold one rack or truck load of trays or pans. If wire mesh trays are used, a standard truck load consists of sixty 30″ x 30″ trays, making a total of 375 square feet of tray surface per compartment. If wooden slat trays are used a standard truck load consists of twenty-seven 30″ x 60″ trays, making a total of 337 square feet of tray surface, and if galvanized iron or block tin pans are used a standard truck load consists of

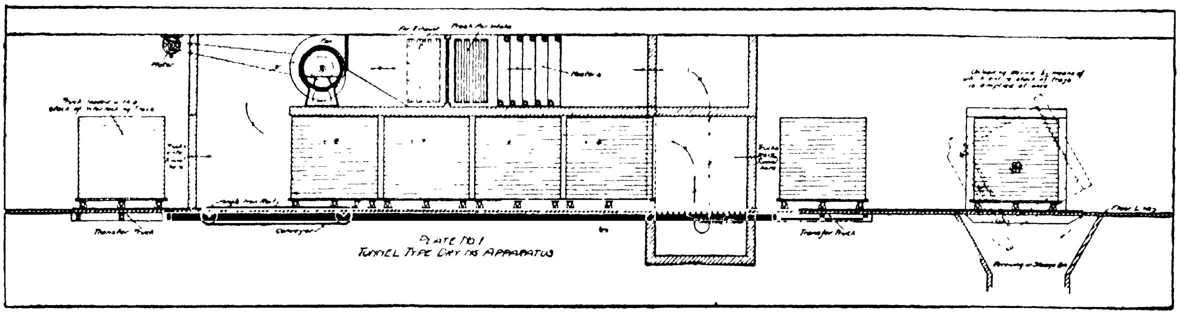


PLATE NO 1
TUNNEL TYPE DRYING APPARATUS

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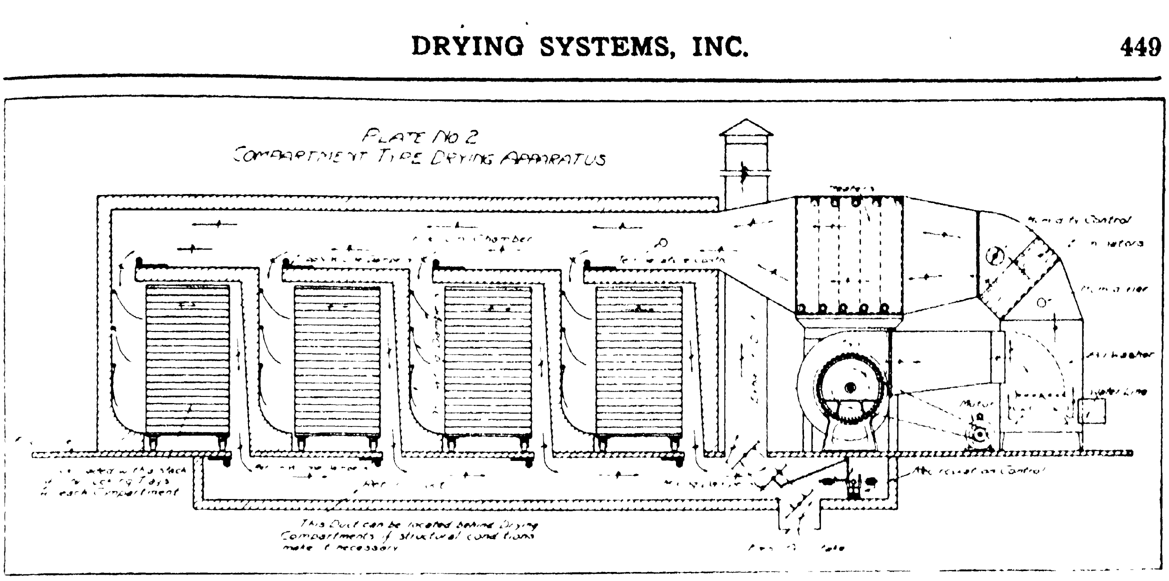


Plate No 2
Compartment Type Drying Apparatus
Heaters
Humidity Control
Air Washer
Water Line
Motor
This Duct can be located behind Drying Compartments if structural conditions make it necessary

sixty 20" x 30" pans, making a total of 250 square feet of pan surface.

The particular features which make this type of drying apparatus most desirable are as follows:

The product to be dried is conveyed to the drying compartments by means of trays and trucks, which makes it possible to load and unload in a comfortable working temperature, and also reduces to a minimum the time during which the dryer is idle

The trays are spaced as close together as the product will permit, thereby insuring a maximum production in a minimum amount of floor space.

Each compartment is virtually an independent drying unit, and only the compartments which are loaded need be operated

All of the air delivered to the drying compartments is washed practically free from dust and dirt, and if conditions require it, is humidified to that particular degree of relative humidity best suited for your work

The Greeff Static Air Washer-Humidifier (Patents No 848,340 and 848,341) used in this connection is absolutely unique in that it produces a perfect washing and humidification of the air, without pump, motor, spray heads or piping. Inasmuch as there are no moving parts, there is nothing to get out of order and the washer is always working at its highest efficiency

All of the air delivered to the drying compartments is uniform in temperature and humidity and a portion of the air after it leaves the drying compartments is allowed to recirculate through the fan and air washer. Temperature, humidity and recirculation (Patents pending) are always under accurate automatic control which reduces the cost of operation and makes the apparatus absolutely independent of outside weather conditions.

All of the air delivered to the drying compartments is distributed uniformly to and through each compartment by means of the mechanical oscillating dampers (Patents No. 1,172,575 and 1,284,218) which cause the entire volume of air delivered to each compartment to flow in rotation through the first, second, third and four levels of the compartment The effect of passing the entire volume of air over one-fourth of the tray surface in this intermittent manner is to bring about a very high pick-up of the surface moisture, followed by three periods of rest or breathing spells during which time the remaining moisture redistributes itself evenly throughout the mass.

SPRAY TYPE DRYER

This equipment consists essentially of a Combination Drying and Collecting Space into which the liquid is introduced through steam or air operated nozzles in the form of a finely divided mist, into an atmosphere heated up to 300°F. or more.

The drying takes place instantaneously and the dry powder falls into the Separation Space where the product and the moisture laden air are removed separately, the powder going into the Packing Hopper from where it can be removed either continuously or intermittently, as desired. This equipment is advantageous in that all of the material is collected at one point without the usual complicated system of collectors and baffles, consequently eliminating the necessity of mixing the powders collected at various points in order to get a uniform product. This also accomplishes a considerable saving in floor space.

Because of the fact that the product is immediately eliminated from the hot chamber many materials such as eggs, milk and syrups containing sugars, proteids, and albumin can be handled without injurious effects from coming in contact with surfaces heated to excessive temperatures.

The spray apparatus as manufactured by us is very simple to operate and does not require expert labor. There is very little to wear out so that the maintenance is fractional. This insures a long life for the equipment.

We specialize in the design and installation of complete equipments for spray drying, exclusive of the buildings and boilers, and are prepared to execute contracts of any size. These dryers are built with capacities to suit the requirements of the purchaser.

A test plant of sufficient capacity is available for careful study of any material.

The following represents a few of the products in liquid form which have been successfully dried by the spray method:—

Milk
Eggs
Fruit Juices
Dyes
Colors
Tanning Extracts
Logwood
Soap
Starch (boiled)
Starch (raw)
Glue
Glucose
Cane Juice
Salt
Various Drugs
Chemicals
Malt
Blood
Blood Serum
Blood Albumin
Sulphite Pitch
Mine Slimes
Arsenate of Lead
Sulphur

Send us a sample of your product and we will make a thorough test in our equipment and submit dry samples, without further obligation.

LABORATORY EQUIPMENT

An ideal equipment for experimental and research work consists of an apparatus 3'0" x 8'0" x 6'0" high. The drying compartment will accommodate twelve 30" x 30" wire mesh trays or twenty 15" x 30" metal pans. The results obtained with this apparatus can be duplicated on a large commercial scale. It is shipped out completely assembled; steam connections and wiring of motor being the only work necessary on customer's premises.

THE DURIRON COMPANY

DAYTON, OHIO

New York
Cleveland
Pittsburgh

Chicago
Atlanta
Montreal

Denver
Salt Lake City
San Francisco

PRODUCTS

Acid Lifts, carboy and drum; Anodes; Arsenic Acid Plants; Autoclaves; Bibcocks; Blowcases; Cascade Systems; Casseroles; Cocks; Concentrating Systems; Condensers; Crucibles; Denitrating Systems; Distilling Apparatus; Ejectors; Evaporating Dishes and Pans; Exhaust Fans; Gate Valves; Jacketed Kettles; Jets; Laboratory Apparatus; Manifolds; Nitric Acid Systems; Pipe and Fittings; Pumps, Centrifugal and Reciprocating; Pots; Pickling Apparatus; Radiation Units; Safety Valves; Spray Nozzles; Sinks; Stills; Stirrers; Tanks and Tank Connections; Towers; Vats; Valves; Special Castings.

DURIRON

Duriron is an extremely hard cast metal alloy containing the proper silicon content to render it entirely resistant to virtually all acids and alkalis used commercially. It has also the desirable property of strength, and is entirely homogeneous, equally resistant on all surfaces and all through the structure. **Its hardness renders it intensely resistant to erosion.**

At temperatures slightly below its melting point (about 2300°F.) it will not soften materially nor lose its shape, and it shows no tendency to oxidation even at the highest temperatures.

On account of its hardness Duriron cannot be machined with cutting tools. It is finished by grinding, and for this work there has been developed a variety of special machines so complete that we can perform virtually all processes of finishing with the exception of threading.

It will be readily appreciated therefore that Duriron apparatus must be produced by this Company, and that ingots or pigs cannot be furnished. The wide serviceability of Duriron in the field of commercial chemistry has resulted in the production of Duriron apparatus and equipment for virtually every process where acids and alkalis are handled or carried, while the widespread adoption of chemistry by industry in general has so widened the field for Duriron that it is now used in a multitude of industries where corrosives are employed to increase the efficiency of production and product.

Our chemical and mechanical engineering forces are maintained to advise and to cooperate in the design of new equipment, and to suggest the adoption of standard equipment for new processes and for all development. Their wide experience will be found valuable, and their services are furnished without obligation.

The adoption of Duriron equipment wherever corrosion is the problem makes an installation permanent; eliminates the expense of repairs and replacements, with their consequent reduction of output; allows for greater and more economically produced product; and betters plant conditions by eliminating the hazard incident to the handling of corrosives.

BULLETINS

All literature is published in bulletin form, this having been found more satisfactory than a general catalog, due to the wide field served by Duriron. Our various types of apparatus are described in detail in these bulletins, and they are constantly being added to and amended, as new uses and mechanical betterments make this necessary.

At present the following bulletins are available, and will be sent on request:

No. 102—Condensers
No. 103—Denitrating Systems
No. 105—Pickling Tanks
No. 107—Carboy Acid Lift
No. 111—Comparative Tests on Vitrified Tile, Lead and Duriron Pipe, made by the Testing Laboratories of Columbia University.
No. 112—Centrifugal Pumps—Nos 100-A and 105
No. 114—Duriron's Value to the Photo-Engraver
No 115-A—Centrifugal Pump—No 101
No. 116—Duriron—a general description
No 117—Exhaust Fans
No. 118—Laboratory Equipment
No. 119—Reciprocating Pumps

U. S. BUREAU OF STANDARDS DEPRECIATION TESTS ON DURIRON

Corrosive	Solution, % by weight	Four months at 15°-20° C		One month at 82°-88° C,	
		loss in mgs. per sq. cm.	% loss	loss in mgs per sq. cm.	% loss
Sulphuric Acid	95% H_2SO_4	118	007	106	006
Sulphuric Acid	25% H_2SO_4	272	016	1 350	076
Sulphuric Acid	10% H_2SO_4	398	025	2 28	126
Nitric Acid	70% HNO_3	105	006	218	012
Nitric Acid	25% HNO_3	123	007	575	054
Nitric Acid	10% HNO_3	no loss	no loss	3 77	232
Hydrochloric Acid	25% HCl	46 992	2 862	534 40	32 170
Hydrochloric Acid	5% HCl	18 9	1 162	71 351	4 186
Acetic Acid	99% CH_3COOH	105	006	039	.002
Phosphoric Acid	87% H_3PO_4	105	006	629	038
Phosphoric Acid	25% H_3PO_4	166	010	658	038
Phosphoric Acid	10% H_3PO_4	136	008	405	024
Oxalic Acid	7 9% $(COOH)_2\ 2H_2O$	238	014	1 975	.111
Oxalic Acid	2 1% $(COOH)_2\ 2H_2O$	211	013	444	.025
Alum	15% $Al_2(SO_4)_3\ K_2SO_4\ 24H_2O$	105	006		...
Picric Acid	9.1% $OH.C_6H_2(NO_2)_3$ (Alcoholic Solution)	077	005	.219	013
Copper Sulphate	25% $CuSO_4.5H_2O$	133	008	1 605	093
Ammonium Chloride	27% NH_4Cl	568	026	4 375	250
Ferric Chloride	48% Fe_2Cl_6	229	013	326 552	17 816
Ferric Chloride	7% Fe_2Cl_6	272	016	106 874	6 276
Oleic Acid	Commercial Oleic	046	003	.099	006
Pyrogallic Acid	31% $C_6H_3(OH)_3$	.122	007	.508	031

In addition to the corrosives mentioned in the above table, Duriron is very resistant to the following alkalis and acids:

Alkalis				Acids		
Ammonium Carbonate	Ferrous Chloride	Tin Tetrachloride	Calcium Chloride	Benzoic	Hydrocyanic	Arsenic
Ammonium Hydroxide	Sodium Chloride	Calcium Carbide	Lead Arsenate	Butyric	Lactic	Boric
Calcium Sulphite	Sodium Hydroxide	Carbon Tetra Chloride		Formic	Tartaric	Pyroligneous

We do not recommend Duriron for the following: Bromine, Hydrofluoric Acid, hot solutions of Ferric chloride and sulphur monochloride.
We are prepared to furnish actual tests on the above acids and alkalis.

Continued on Next Page

No 120—Duriron's Value to the Sanitary Engineer
No. 122—Standard Pipe and Fittings, Valves, Cocks, Ejectors, etc
No 123—Kettles
No 124—Sulphuric Acid and Fertilizer Plants
No 125—Radiation Units, and Acid Equipment
No 126—Drain Pipe and Sanitary Fittings, Sinks, Drains, etc

Those desiring to make their own tests of Duriron's resistance to corrosion will be furnished with sample of this alloy, our guarantee being that any material furnished will be equally resistant.

PHYSICAL PROPERTIES OF DURIRON

Specific gravity	7.00
Weight per cubic inch	0.253 lb
Tensile strength	about 10,000 lbs per square inch
Transverse strength	1,000 lbs with deflection between 1/16" and 1/8"
Compression strength	70,000 lbs per square inch
Melting point	about 2,300°F
Coefficient of expansion	.00001565 per degree F
Shore scleroscope hardness	49–51
Contraction allowance in casting	3/16" per foot
Electrical resistivity	63.3 Microhms per cc at 0°C 71.2 Microhms per cc at 18°C 94.4 Microhms per cc at 100°C

THERMAL CONDUCTIVITY (Values, Except Duriron, from Kent)

Silver	Copper	Aluminum	Cast Iron	Duriron	Lead	Glass
1000	811	665	359	323	287	2

DURIRON STANDARD PIPE

Is cast in standard lengths and forms. It is superior to all other forms of acid-resisting pipe, being stronger and equally resistant to corrosion inside, outside and all through the wall. Standard Duriron Pipe is now made with collar cast on the ends, and joint is made with split flanges of a very high tensile gray iron (made by ourselves). While pipe cast with integral flanges may still be furnished, the great superiority of the split flange type recommends it in most cases.

BELL AND SPIGOT (OR HUB) PIPE

For drain lines, or where low pressures are carried, Duriron Bell and Spigot Pipe is most desirable, being more readily installed, and not requiring exact alignment.

COMPRESSION COUPLINGS

In long lines, and those subject to wide temperature variations, it is often desirable to use an occasional compression coupling joint, to take care of expansion, and to serve as a convenient means of opening up the line.

PIPE FITTINGS

Complete lines of pipe fittings, both for Standard and Bell and Spigot Pipe, are furnished. Standard fittings may be had either for split flange, or with integral flange. Bell and Spigot fittings have recently been redesigned to comply with the most exacting requirements of modern sanitary and plumbing codes.

CONNECTIONS TO OTHER PIPE

By means of companion flanges, which we furnish, Duriron lines may be connected to all other types of pipe. Long experience in meeting such requirements makes it possible for us to supply suitable connections in all cases.

TESTS

All forms of Duriron Pipe are thoroughly tested for capacities far above their requirements before leaving our plant.

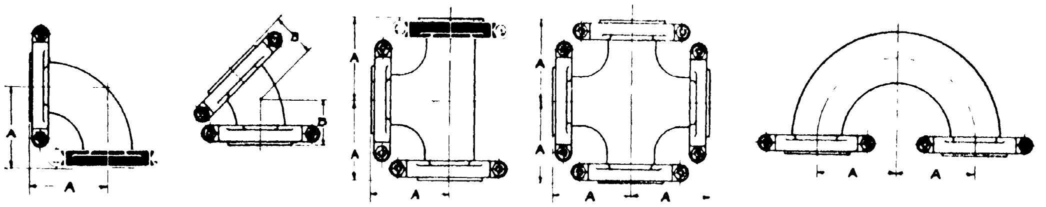
STANDARD DURIRON PIPE DATA

Inside dia of pipe inches	1	1½	2	2½	3	4	6	8	10	12
Wall thickness, inches	5/16	5/16	⅜	⅜	7/16	7/16	½	⅝	¾	1
Maximum dia of Flange, inches	4	5	6	7	7½	9	11	13½	16	19
Diameter of Gasket, inches	2¼	3⅛	3⅞	4⅝	5⅛	6⅜	8⅜	10⅝	13	15¾
Diameter of Bolt Circle, inches	3	3⅞	4¾	5½	6	7½	9½	11¾	14¼	17
Diameter of Bolt Holes, inches	½	9/16	¾	¾	¾	⅞	⅞	⅞	1	1
Number of Bolt Holes	4	4	4	4	4	8	8	8	12	12
Size of Bolts, inches	7/16	½	⅝	⅝	⅝	¾	¾	¾	⅞	⅞
Weight per Foot Plain Pipe, lbs	4.6	6.1	8.9	10.8	15	19.4	32	54	80	130
Maximum Standard Length	3' 0"	4' 0"	4' 0"	4' 6"	5' 0"	5' 0"	6' 0"	6' 0"	6'-0"	6'-0"

Longer or shorter lengths than standard can be made special at increased cost per foot Information on request

STANDARD DURIRON PIPE FITTINGS

(Showing split Flanges in place on Fittings)



DIMENSIONS OF STANDARD SPLIT FLANGE FITTINGS

Size, inches	1	1½	2	2½	3	4	6	8	10	12
A—Center to face, inches	3½	4	4½	5	5½	6½	8	9	11	12
B—Center to face of 45° Ells, inches	1¾	2¼	2½	3	3	4	5	5½	6½	7½
Maximum dia of Flange, inches	4	5	6	7	7½	9	11	13½	16	19
Number of Bolts	4	4	4	4	4	8	8	8	12	12
Size of Bolts, inches	7/16	½	⅝	⅝	⅝	¾	¾	¾	⅞	⅞
Size of Bolt Holes, inches	½	9/16	¾	¾	¾	⅞	⅞	⅞	1	1
Diameter of Bolt Circle, inches	3	3⅞	4¾	5½	6	7½	9½	11¾	14¼	17

Above dimensions conform to U S 1912 Standard

If a combination fitting is desired, for example a tee with one flange, one bell and one plain end, or say, an elbow with one flange end, the other end plain, they may be furnished as required

STANDARD DURIRON BELL AND SPIGOT PIPE DATA

SINGLE HUB

Size	1½"	2"	3"	4"	6"
Length of Joint	4'	4'	5'	5'	5'
Average Weight per Joint	22 lbs.	30 lbs.	53 lbs.	71 lbs.	136 lbs.

DOUBLE HUB

Size	1½"	2"	3"	4"	6"
Length of Joint	3'	4'	5'	5'	5'
Average Weight per Joint	20 lbs.	34 lbs.	61 lbs.	81 lbs.	147 lbs.

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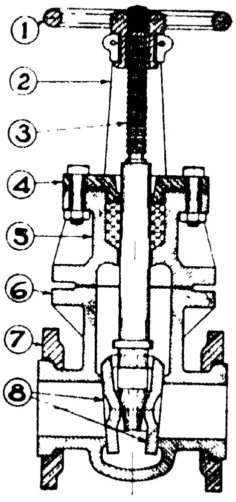


DURIRON GATE VALVE
1, Hand Wheel; 2, Yoke; 3, Valve Stem, 4, Packing Gland, 5, Bonnet, 6, Valve Body; 7, Split Flange; 8, Valve Discs.

DURIRON VALVES AND COCKS

These are standard equipment for carrying corrosives. Careful accuracy of finish renders all parts interchangeable.

DURIRON GATE VALVE

The Duriron Gate Valve has been on the market for nearly two years, and tried out under all possible conditions where former equipment had proved unsatisfactory. There has been no complaint registered against the operation of this valve. In cases where it received extremely rough handling there was an occasional broken flange. This has now been overcome by split flange design.

DURIRON GATE VALVES

Size, Inches	Face to face of Flanges, Inches	Extreme overall height (open), Inches
1	5¾	14½
1½	7	20½
2	7	21½
3	8	28
4	9	30½
6	13½	41½

DURIRON PLUG COCKS

The many years' service of Duriron Plug Cocks has proved their efficiency and the excellence of their design. Scores of thousands of these cocks in service bear witness to their universal usefulness in handling corrosives. Dimension table follows:

STRAIGHTWAY PLUG COCKS

Size, Inches	Face to face of Flanges, Inches	Size of bolt holes for block type, Inches
⅜	2⅝	*
¾	4¼	9/16
1	4⅞	5/8
1½	5⅝	11/16
2	6¾	13/16
2½	7⅝	13/16
3	8⅝	13/16
4	12¼	1

* Block type only

Some users prefer to install cocks as a block, using two long bolts, clamping cock between pipe flanges. Size of hole for such two-bolt installation is shown in above table. For flange dimensions see Standard Pipe Data Table. Slots instead of holes are used for ¾″ and 1″ sizes for flanged installation.

THREE WAY COCKS

Size, Inches	Face to face of opposite flanges, Inches	Center to face of side outlet flange, Inches
1	7	4¼
1½	8	5
2	9	6
3	11	7¼
4	11½	7¾

CHECK VALVES

Straightway or angle type, furnished in sizes of 1½, 2, 3 and 4 inches.

SAFETY VALVES

Beam type, furnished in sizes of 1 and 2 inches. May be furnished armored for extremely high pressures.

DURIRON PUMPS

The two most important requisites of a chemical pump are resistance to corrosion and erosion.

Duriron has both to the highest degree, and is therefore, of itself, the ideal material for this type of apparatus.

Years of engineering development work in perfecting Duriron pumps mechanically to meet the peculiar requirements of corrosive pumping, has resulted in a line that is complete, and adapted to virtually any industrial process where acids are handled.

All parts of these pumps coming in contact with the solutions carried are of Duriron.

All parts are accurately finished to gauge, and are therefore interchangeable. Duriron pumps are all designed to render long service efficiently and with a minimum of attention. They are furnished either for belt drive or with special base for direct connected drive.

Duriron pumps are produced in standard sizes in the following types:

Reciprocating Plunger Pumps, single and duplex; for belt and steam drive.

Centrifugal Pumps, belt or motor drive. Furnished with motor complete if desired.

We recommend that those interested write for Bulletins and detailed information, such as capacities, heads, H.P., etc.

Standard Pumps

Centrifugal, 2″ suction by 1½″ discharge

Centrifugal, 5″ suction by 4″ discharge

(Centrifugal pumps are produced in types for low and high head, and with closed and open impeller)

Reciprocating, 6″ x 4″ x 8″, steam drive; and 4″ x 8″ gear drive

Reciprocating, 4″ x 2″ x 4″ and 4″ x 3″ x 4″, steam drive; and 2″ x 4″ and 3″ x 4″ gear drive.

DURIRON EJECTORS

Duriron Ejectors are designed to give the best efficiency possible for this type of apparatus, and, as in pumps, the extreme resistance both to corrosion and erosion assures an unlimited period of service.

Their jets are interchangeable, and they may be replaced without removing the Ejector from line. Special jets to fit the standard body are supplied.

TABLE OF DIMENSIONS, DURIRON EJECTORS

Standard Size	Flanged Connections		Overall length	Suction flange to center line
	Steam	Suction & delivery		
1″	1″	1″	6½″	3″
1½″	1½″	1½″	7⅞″	3 9/16″
2″	1½″	2″	9 7/16″	4 3/8″
2½″	2″	2½″	12¼″	4 15/16″

DURIRON EXHAUST FANS

Duriron Exhaust Fans handle corrosive vapors with the same facility that Duriron pumps carry corrosive liquids, and their sturdy construction permits higher speeds than similar apparatus of other materials, thus giving much higher efficiency.

They are produced in four standard sizes: 3″ suction and exhaust; 4″ suction and exhaust; 8″ suction and exhaust, and 12″ suction and exhaust. The three larger sizes may be furnished either for belt drive or for direct connection to motor. The 3″ size is furnished only with motor (1/6 H.P.) complete.

Bulletin giving capacities and all data mailed on request.

Continued on Next Page

DURIRON KETTLES

Grouped under the term "kettle" is apparatus which may be known to the user as Nitrator, Sulphonator, Hydrogenator, Acetylator, Still, Evaporator, Mixing or Cooking Kettle.

The Duriron line of this apparatus is most complete, ranging from an experimental laboratory size of one gallon capacity (which is furnished complete with jacket, stirrer and drive) to those of a thousand gallons capacity. These are of different types, and are equipped with a wide variety of openings, outlets, jackets, agitators, etc., to meet the different uses required of them.

Our long experience in producing kettles has resulted in a standard line that, by minor modifications, may be utilized for virtually any chemical process, and this standardizing of design assures the customer of a saving in pattern costs and in time of delivery.

Duriron kettles are usually heated by using a steam jacket or oil bath.

In smaller sizes direct heat may be used when proper setting is provided and a uniform temperature is maintained.

Stirrers, Agitators and Scrapers of all types are produced to take care of any operation that may be required. Boiler plate and cast iron jackets furnished.

Our bulletin on kettles gives much data and illustrates our standard design.

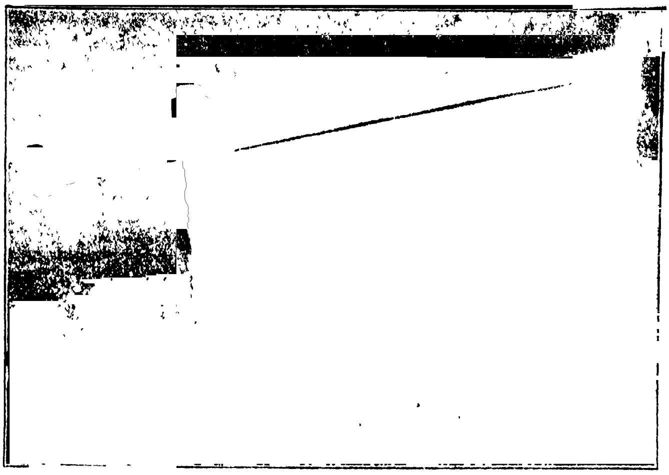
We also gladly cooperate in advising methods of accomplishing new processes where our kettle apparatus is necessary, and the experience gained by a wide diversity of development makes our counsel valuable.

DURIRON NITRIC ACID CONDENSER

The complete Duriron Nitric Condenser has long enjoyed the reputation of being the most efficient and desirable apparatus obtainable for the condensation of acid vapors.

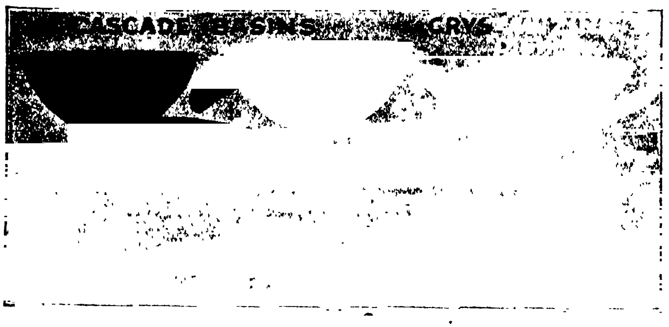
DURIRON CASCADE SYSTEM

In the concentration of sulphuric acid by the cascade system, Duriron equipment has proven itself more satisfactory, efficient and economical than any other material. All the necessary parts for a complete installation have been made standard apparatus and basins and pans are stocked for immediate shipment.



DURIRON RADIATION UNIT

We have most complete data on performance of Duriron cascade systems, and this may be had upon application.



DURIRON LABORATORY DISHES

DURIRON DENITRATING SYSTEM

Complete denitrating systems from standard Duriron patterns are furnished.

DURIRON "S" BEND CONDENSER TUBES

Standard Duriron Condenser Tubes and connections, "S" Bend type, in sizes from 1½" to 8" inside diameter. We can also furnish Condensers complete with cast iron water jacket. Laboratory Condenser for experimental work.

DURIRON LABORATORY EQUIPMENT

The universal resistance of Duriron to corrosives used commercially and in experimental research, as well as its ability to withstand high temperatures, renders it of great value for laboratory utensils and equipment. Its value in the laboratory in research and experimental work is this: any process carried out in Duriron may then be produced in commercial quantity in Duriron units of commercial size capacity with exactly similar results.

DURIRON RADIATION UNIT

The Duriron Radiation Unit for submerged service is made up of "S" Bends so designed that they afford a maximum surface for heating or cooling, while occupying a minimum space. Corrosives may be handled either inside or outside without coming in contact with other metal than Duriron. Steam may also be used for heating. Individual members are interchangeable, and great flexibility as to number of members and position of installing is possible.

THE DURIRON POLICY

It is the fixed policy of The Duriron Company to recommend the adoption of Duriron only when convinced that it will serve the purpose better than any other material.

EASTON CAR AND CONSTRUCTION CO.

Complete Industrial, Plantation, Contractors and Portable Railway Equipment

191 FULTON STREET, NEW YORK, N. Y.

WORKS EASTON, PA

PRODUCTS

Cars (for every industrial purpose)
Rails and Portable Track
Switches, Permanent and Portable
Turntables, Crossings
Wheels and Axles.

This space permits of only a bare summary of the wide and complete variety of Easton industrial railway equipment. Full specifications and additional and larger illustrations will gladly be sent to supplement these small cuts.

This company designs and builds narrow-gage railways complete, for all industrial purposes: contracting operations, factories, yards, warehouses, plantations, docks, power plants, quarries, etc. It furnishes everything required for a complete installation, either to its own or to customer's drawings and specifications: cars, rails and accessories, locomotives, switches, frogs, turntables, etc.

The benefit of thirty years' experience is to be had for the asking.

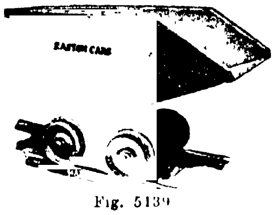


Fig. 5139

STANDARD SCOOP CAR

Code Word	Capacity	Track Gage	Body Length	Body Width	Body Depth	Height Overall	Length Scoop End	Wheel Base	Axles	Wheels	Frame Channel	Plates	Weight Lbs
Sporcheyza ...	18	18"	4'-11"	2' 0"	2'-0"	3'-5"	2'-4¼"	20"	1½"	10"	6"	⅛"	540
Sporisori	18	24"	"	2' 0"	"	3'-5"	2'-4¼"	"	1½"	10"	"	"	550
Sporobole	18	30"	"	2'-0"	"	3'-7"	2'-6"	"	1½"	10"	"	"	570
Spora	18	36"	"	2'-0"	"	3'-7"	2'-6"	"	1½"	10"	"	"	580
Sporocarp	27	18"	"	3'-0"	"	3'-6"	2'-5¼"	"	1¾"	12"	"	"	700
Sporatorne .	27	24"	"	3' 0"	"	3'-6"	2'-5¼"	"	1¾"	12"	"	"	710
Sportfully .	27	30"	"	3'-0"	"	3'-8"	2'-7"	"	1¾"	12"	"	"	730
Sport	27	36"	"	3' 0"	"	3'-8"	2'-7¼"	"	1¾"	12"	"	"	760

Note—Table gives the rated capacity figured with heaped load

Fig. 1005

STANDARD PLATFORM CAR

Code	Platform Dimensions Length	Platform Dimensions Width	Height	Wheels	Axles	Frame Channel	Wheel Base	Track Gage	Floor	Capacity in Tons	Weight
Stobrorum	4'-9"	3'-0"	15"	12"	1½"	5"	20"	20"	1½"	2-3	
Stachetto .	5'-0"	3'-4"	15"	12"	1½"	5"	24"	24"	1½"	2-3	
Stockblind	6'-0"	4'-0"	15"	12"	1½"	5"	24"	24"	1½"	2-3	
Saber	6'-0"	4'-0"	18"	14"	2"	6"	30"	24"	1½"	5	
Sable	8'-0"	4'-6"	19"	16"	2¼"	6"	42"	36"	1½"	5	1,
Saccharine	12'-0"	6'-0"	22"	16"	2¾"	7"	72"	4'-8½"	1½"	6	2,

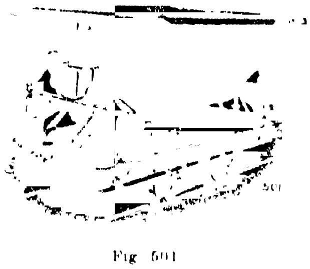


Fig 501

STANDARD ROCKER DUMP CAR

Code word	Capacity Cu. feet	Capacity Tons	Track Gauge	General Dimensions Length overall	Width overall	Height overall	Loading Height	Throw of body	Wheel base	Body Length inside	Width inside	Plates Side	Plates End	Running Gear Wheel dia.	Axle dia.	Weight lbs
Rate	18	1	24"	6'-8"	3' 11"	3'-7½"	2'- 9"	2' 0"	2'-0"	4'-2"	3' 8"	⅛"	⅛"	12"	2"	900
Fate	27	1½	24"	7'-3"	4'- 5"	3'-10"	2' 11"	2' 1"	2' 0"	4'-9"	4' 2"	⅛"	⅛"	12"	2"	1000
Gate	27	1½	30"	7'-3"	4'- 5"	3'-11"	3' 4"	2'-4"	2'-0"	4' 9"	4'-2"	⅛"	⅛"	12"	2"	1075
Hate	40	2	24"	8'-0"	5'- 4"	4'-6½"	2'- 7"	2'-3½"	2'-6"	5' 5"	5'-0"	⅛"	3/16"	14"	2"	1425
Kate	40	2	30"	8'-0"	5'- 4"	4'- 7"	3'- 0"	2' 6½"	2'-6"	5'-5"	5'-0"	⅛"	3/16"	14"	2"	1475
Late	40	2	36"	8'-0"	5'- 4"	4'- 8"	3'- 0"	2'-8"	2'-6"	5'-5"	5'-0"	⅛"	3/16"	14"	2"	1525
Mate	54	3	30"	8' 8"	5'-10"	4'-10"	3'- 0"	2'-7½"	2'-6"	6'-0"	5'-6"	3/16"	¼"	14"	2¼"	1750
Pate	54	3	36"	8'-8"	5'-10"	4' 11"	3'- 0"	2' 9"	2'-6"	6'-0"	5'-6"	3/16"	¼"	14"	2¼"	1790

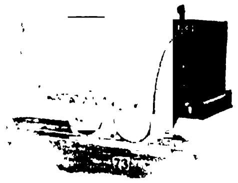


Fig 73

STANDARD COAL CHARGING CAR

Capacity	½ ton	1 ton	1½ ton
Gage	24"	24"	24"
Code Word	Treckfoss	Treckung	Treckler
Body length inside	4'-6"	5'-0"	6'-0"
Body width inside	3'-4"	3'-10"	4'-0"
Body depth inside	1'-6"	2'-0"	2'-6"
Overall height	3'-0"	3'-8"	4'-5"
Height to floor	1'-6"	1'-8"	1'-8"
Plates	⅛"	⅛"	⅛"
Wheels	12"	14"	14"
Weight	750 lbs	1000 lbs.	1300 lbs.

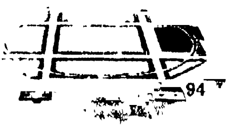


Fig 94

STANDARD CAST-IRON BALL-BEARING TURNTABLE WITH AUTOMATIC LOCKING DEVICE

Diameter of Top.	40"	44"	48"	52"	60"	72"	84"
Track Space	41¼"	45¼"	49¼"	53¼"	61½"	7[illegible]"	86½"
Capacity (Tons) .	3	4	4	6	6	7	8
Standard Gauge .	20"	24"	24"	24"	24"	24"	24"
Weight, lbs	700	800	1,150	1,275	1,675	2,800	3,400
Code Word	Revolvedor	Revolving	Revolution	Revotaba	Revuelto	Revue	Revulsarum

Turntables 44" to 84" will also fit 24½" outside track gage. Other gages than standard can be furnished at a slight additional cost.

Continued on Next Page

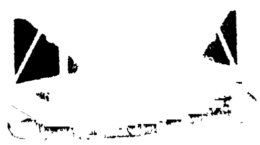


Fig. 1543

SPECIAL HOPPER BOTTOM CAR

Built of steel and wood instead of the usual all steel construction A number of designs of all steel Hopper Bottom Cars are shown in Illustrated Bulletin No 7

Fig 276

STANDARD CRADLE DUMP CAR WITH BRAKE

Also built to dump endwise or all around Standards in stock.

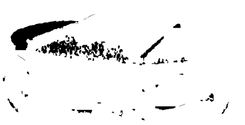


Fig 2665

TURNTABLE

Built for carrying 35-ton locomotive crane on standard gauge track Steel top covers entire pit

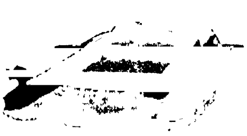


Fig 135

CROSSING

Of any design, angle, gauge, or weight of rail

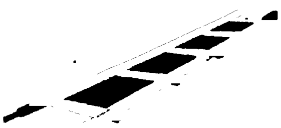


Fig. 77

PORTABLE TRACK ON STEEL TIES

Of any gauge and weight of rail

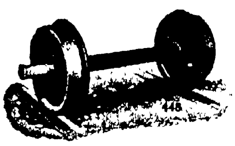


Fig. 448

WHEELS AND AXLE

Of any design and for all gauges

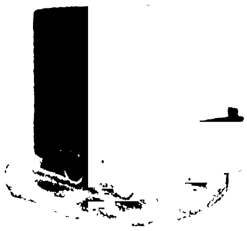


Fig 622

SPECIAL ROCKER DUMP CARS

These are designed and built to meet any specifications or conditions, and are made either side or end dump

Fig 444

EXTRA HEAVY CENTER DISCHARGE HOPPER CARS WITH DROP DOORS

One of many types

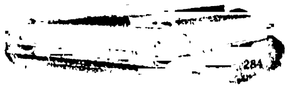


Fig 284

TRANSFER CARS

Built in a number of designs, many of them being underslung, so the load platform is very close to the ground

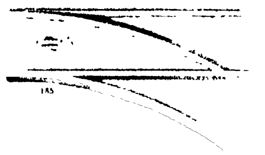


Fig 185

CAST IRON PLATE SWITCH AND CAST IRON PLATE TRACK

For boiler rooms, power plants, etc

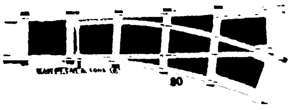


Fig 80

PORTABLE SWITCHES WITH OR WITHOUT STEEL TIES

All gauges and weights of rail

Fig. 87

ROLLER IN HUB WHEELS ON SQUARE AXLES

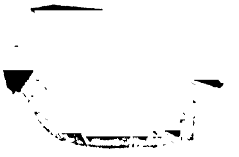


Fig 435

GABLE BOTTOM CAR

We build all types in standard and special designs with and without brakes, the smaller sizes being 4 wheel construction and the larger sizes double truck, or 8 wheel construction

Fig 3510

ROCKER DUMP TRAILER

With extra wide tired wheels for uneven soft ground, used in connection with tractors

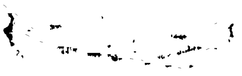


Fig 1184

EASTON ANNEALING FURNACE CAR

Widely used in steel mills, foundries, automobile and other factories where annealing and heat treating of castings, chains, forgings, etc, is a part of the manufacturing process

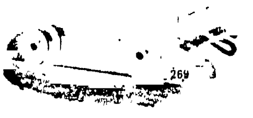


Fig 269

ALL-STEEL SKIP CAR

Built in various designs and to meet special requirements

Fig 1533

SPECIAL DOUBLE TRUCK PLATFORM CAR

Built to meet any specific requirements and in any desired size. Both with and without brakes

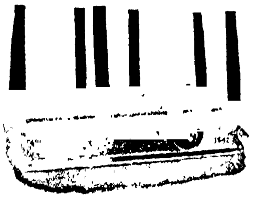


Fig. 1542

PLATFORM CAR

Same as standard platform car, Fig. 1005, except equipped with stake pockets and stakes

Fig 974

ROCKER DUMP CAR

Special for locomotive traction, These large cars are made in any capacity or design, for any track gauge and either with or without brakes and automatic couplers

Fig 1886

END DISCHARGE CAR

Special design with chute and sliding gate Other End Discharge Cars are shown in Illustrated Bulletin No 7

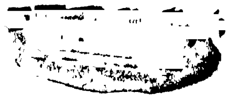


Fig 2236

CHARGING BOX CAR

Capacity 10 tons, gauge 4 ft 8½ in, length 10 ft 6 in, width 6 ft 3½ in. We build all types of Charging Box Cars in standard and special designs

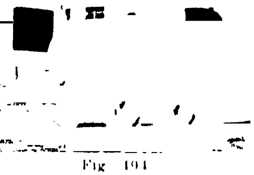


Fig 191

LOCOMOTIVE

Gasoline and Oil burning steam. 3–12 ton, any gauge

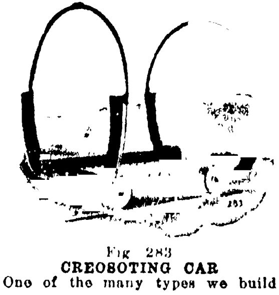


Fig 283

CREOSOTING CAR

One of the many types we build

Fig. 403

ROTARY DUMP MINE CAR

Designed especially for mine work, in tunnels and other services where small over-all dimensions are an important feature

Howard W. Beach, President — Willard C. Beach, Sec'y & Treas

ECLIPSE AIR BRUSH COMPANY

Manufacturers of Low Pressure Pneumatic Painting Equipment

79 ORANGE STREET, NEWARK, N. J.

PRODUCTS

- Air Brushes
- Pneumatic Painting Equipment
- Sprayers
- Lacquer Sprayers
- Varnish Sprayers

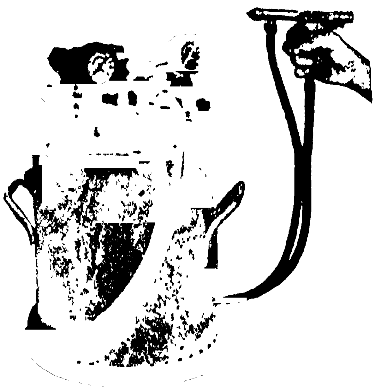
ECLIPSE PNEUMATIC PAINTING EQUIPMENT

Easily cleaned. Paint can be forced back into the container without disconnecting. Thinner can be run through the machine without using spraying pressure and without loss. Durably constructed. Practically no upkeep cost. Perfect regulation of flow of material, separate from atomizing pressure. Non-corrodible throughout. Straight-side paint container, hot-galvanized, with handles welded to sides—Cone shaped nozzle for irregular surfaces and fan-shaped nozzle for wide, flat work.

MODEL "G" AND MODEL "F"

The Model "G," or gun-type, for heavy, fast work or where a large quantity of material is used. Made in 5 and 15 gallon sizes.

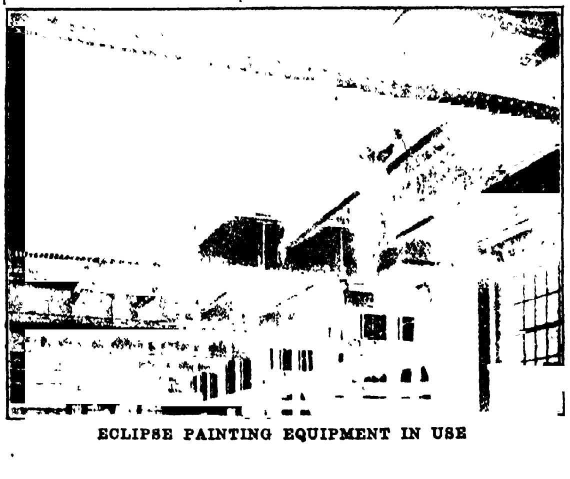
The Model "F," or attached-container type, for fine finishing work where the colors are frequently changed and for the application of lacquers, bronzing materials, insulating varnishes, etc. Made in pint, pint and a half and quart sizes.



MODEL "G"

LOW PRESSURE

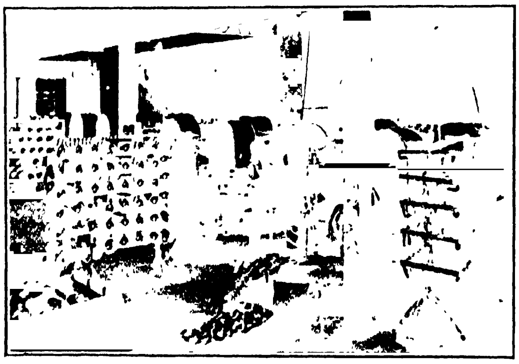
Low pressure eliminates objectionable fumes; applies materials as compounded, without air reduction taking place or the removal of the adherent and coherent qualities; materials are not chilled in the application.



ECLIPSE PAINTING EQUIPMENT IN USE

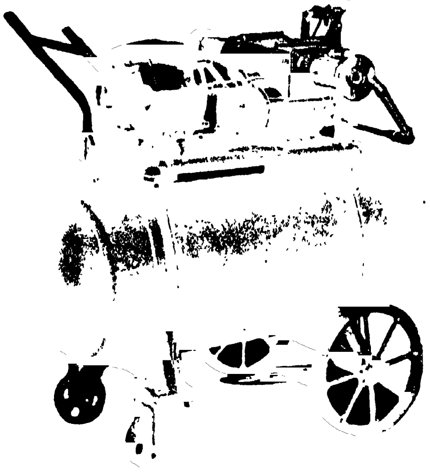
ECLIPSE EXHAUST EQUIPMENT

Designed and constructed in accordance with the rules of Department of Labor, Board of Fire Underwriters, Bureau of Hygiene and Sanitation. Cast aluminum, non-abrasive, propeller-type of fan used. Motor located outside of vapor-duct and cannot come in contact with fumes.



ECLIPSE EXHAUST EQUIPMENT

PORTABLE PAINTING EQUIPMENT



PORTABLE PAINTING EQUIPMENT

For interior and exterior maintenance work. One Air Brush operator will accomplish as much in one hour as a hand or bristle-brush worker will in a day. All the dipping and dripping is done away with and the cost of bristle brushes saved.

Portable electrically-driven air compressing units in any capacity. The Low Pressure Model "G," because of its low air consumption, can be operated from a direct connected, electrically-driven compressor with ½ H.P. motor.

Two-brush compressor, as shown in the cut, uses but ¾ H.P. motor.

GUARANTEE

The Eclipse Air Brush is guaranteed to you against defective workmanship and material and to give you better results than can be obtained with any other device or method.

EIMER & AMEND

Headquarters for Assay, Bacteriological and Chemical Laboratory
Apparatus of all Kinds, Also for Chemical Reagents,
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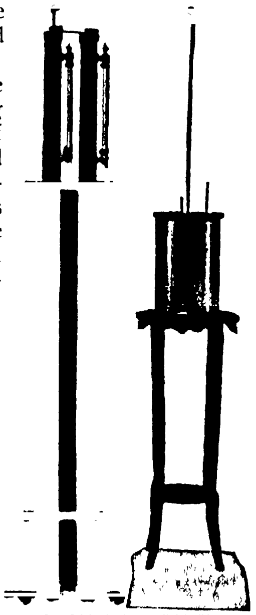
Chemical Laboratory Apparatus of all kinds, especially for Industrial, Testing, and Bacteriological Laboratories, also Chemicals, Drugs, Minerals, Stains, and Tested Purity Reagents.

BINGHAM AND GREEN VISCOMETER AND PLASTOMETER SIMPLIFIED FORM

Especially intended for the testing of Paints, Oils and Varnishes.

This apparatus can be used, however, for testing the viscosity of any form of liquid, besides being adapted for determining the plasticity of all plastic materials for which the initial pressure required is not more than that of a 10 foot water column.

For information in regard to auxiliary apparatus, and for details of the original complete outfit as regularly used in exact scientific research, see E. & A. Bulletin No. 277, also Bureau of Standards Bulletins Nos. 278 and 298, Proc. of A.S.T.M., Vols. 18 and 19; also Jour. of Amer. Chem. Soc. Vol. 38, P. 40, 1916, etc.



BINGHAM & GREEN VISCOMETER AND PLASTOMETER

BROOKS ROTATING AUTOCLAVE

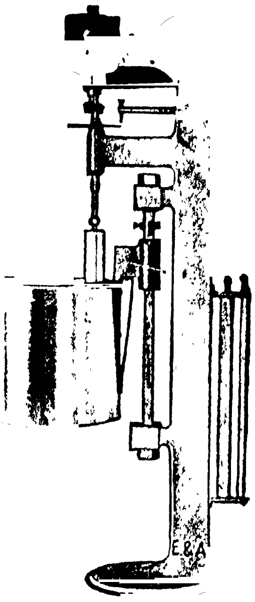
Specially adapted for laboratory work. Stirring by rotation prevents local overheating. The autoclave is especially adapted for reaction mixtures, containing much solid matter as salts, etc. There is no stuffing box to develop leaks. Direct heating, made possible by rotation, gives maximum temperature range. There is no bother with steam connections, nor hot oil jackets with their carbonization trouble and fire hazard. The autoclave is light, compact and portable. An electric light socket and a gas burner are all the requirements needed.

The autoclave is provided with pressure gauge to 500 pounds with special silver diaphragm connection, thus precluding injury to the spring coil of the gauge from corrosion or clogging. Special linings are supplied to meet requirements.

OIL EMULSION APPARATUS FOR THE DEMULSIBILITY TEST U. S. NAVAL STATION DESIGN IMPROVED BY E. AND A.

The Bath maintains the contents of the graduated cylinder at a temperature of 55°C. There is a special stirrer, with motor and governor, for maintaining a constant speed of 1500 R.P.M.

E. and A. improvements are the arrangement whereby the bath moves up and down instead of the motor, and the governor for the motor. The apparatus is furnished complete with motor, governor, stirrer, electric heating arrangement and 6 cylinders.



OIL EMULSION APPARATUS

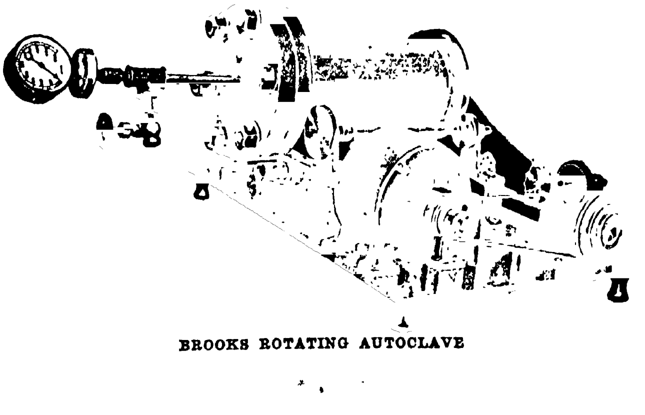
MACMICHAEL VISCOSIMETER

Recommended for the testing of oils, varnishes, glues and similar materials.

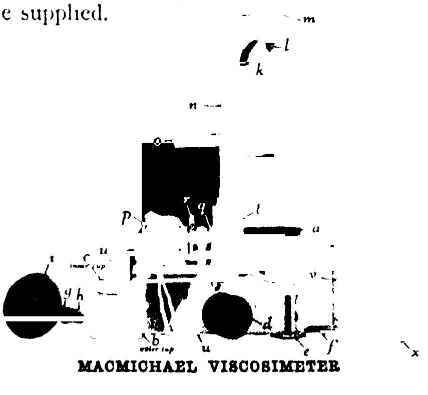
The viscosity range is from that of the lightest liquid up to that of the heaviest glue. The instrument is portable and rugged in construction.

Technical training is not required to operate. The motor is universal for A.C. or D.C.

In ordering advise voltage, also approximate viscosity of materials to be tested, so that suitable torsion wires may be supplied.



BROOKS ROTATING AUTOCLAVE



MACMICHAEL VISCOSIMETER

ELECTRIC HEATING APPARATUS COMPANY

Regularly carried in stock by
Eimer and Amend
New York Pittsburgh
Braun Knecht Heimann Co
San Francisco
The Braun Corporation
Los Angeles
Lymans Ltd
Montreal

Electric Furnaces and Heat Appliances

BRANCH OFFICE
25 Church Street
NEW YORK, N. Y.

GENERAL OFFICE AND FACTORY
18 to 34 Nesbitt Street
(Formerly 123-125 Sussex Ave)
NEWARK N. J.

Regularly carried in stock by
Arthur H Thomas Co
Philadelphia
The Mine & Smelter Supply
Co, Denver, El Paso,
Salt Lake City
Central Scientific Co, Chicago
Canadian Laboratories Supplies, Ltd, Toronto
Denver Fire Clay Co, Denver

PRODUCTS

Multiple Unit Furnaces; "Hevi-Duty" Furnaces; Multiple Unit Electric Furnaces for Organic Combustions; Electric Hot Plates; Flask Heaters, Etc.

HEVI-DUTY ELECTRIC FURNACES, MUFFLE TUBE, CRUCIBLE TYPES: MADE IN ANY SIZE

May be operated continuously at 2000° F. (1100° C.) Operate on low voltage and therefore preferably on A. C. through transformer. Return bend coils of the heating elements are of large diameter wire.

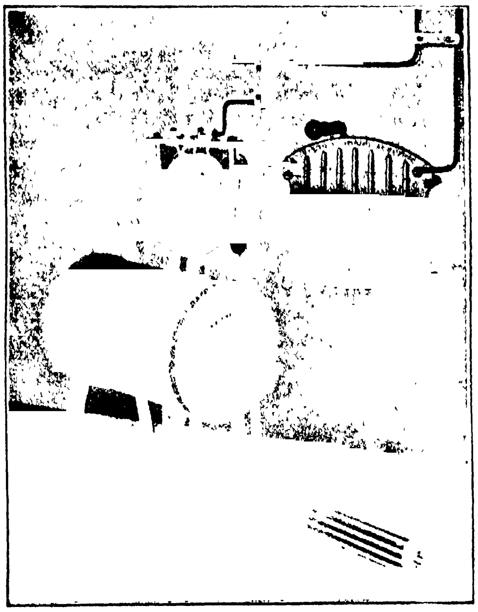
Trade Mark

HEVI-DUTY

Registered U S Pat Office

Low voltage furnaces nearest **"Hevi-Duty"** in efficiency require about 45% more energy to reach 1100°C. and average in excess of 175% more energy operating at normal working temperatures.

At maximum temperatures **"Hevi-Duty"** furnaces maintain 1100°C. with an average of 35.9% of their full load ratings, leaving 64.1% available for useful heat work. No other furnaces equal this efficiency. The durable construction and workmanship of **"Hevi-Duty"** furnaces are on a par with their efficiency and economy.

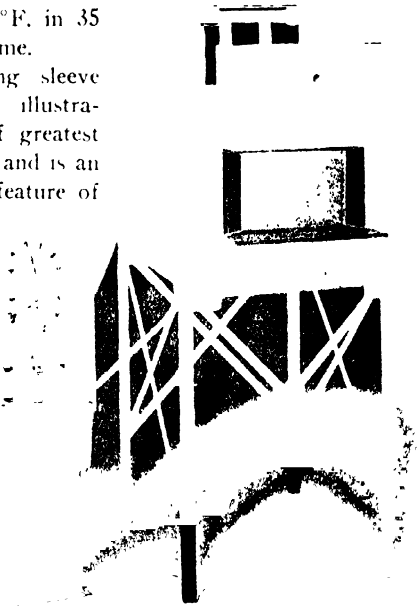


TYPE HD99 SINGLE TUBE COMBUSTION FURNACE

Complete with transformer and regulating rheostat Spare protecting sleeve and return bend coil shown in right hand lower corner. Size inside 1¼" x 10". Tube center 10" from bench. Made also for five tubes in one furnace.

This furnace is the most economical of all electric combustion tube furnaces. Operating at 2000° F., 1900° F., 1800° F. and at 1600° F., the furnace consumes 430 watts, 375, 325 and 240 watts, respectively, per hour. It has a maximum demand of 7/10 K.W., attains 2000° F. in 35 minutes' time.

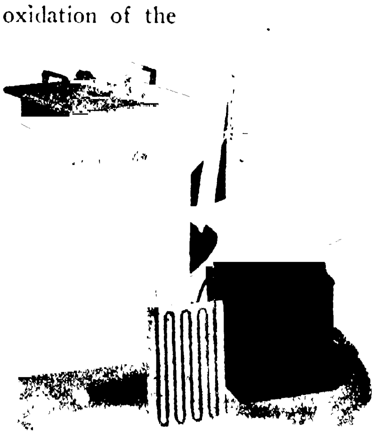
Protecting sleeve shown in illustration is of greatest advantage and is an exclusive feature of the **"Hevi-Duty"** furnace; it diffuses the heat, thus insuring absolute uniformity of temperature; offers great protection against oxidation of the heating element; and prevents short circuiting of the coil by means of bare elements of the thermo couple, such as is usually used in furnaces of this type.



HEVI-DUTY MUFFLE FURNACE

Made in six sizes, from 4" wide, 3" high, 10" deep for bench use up to 12" x 8" x 36" with steel stands for floor use

Catalog "E" gives complete details of **"Hevi - Duty"** furnaces.



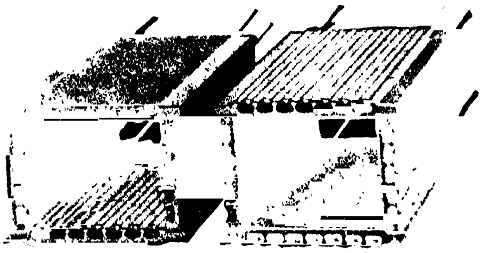
CRUCIBLE FURNACE

Hevi-Duty crucible furnaces are made in three sizes, 4" square 6" deep, up to 10" square 14" deep

Continued on Next Page

MULTIPLE UNIT ELECTRIC FURNACES, MUFFLE, CRUCIBLE, TUBE TYPES

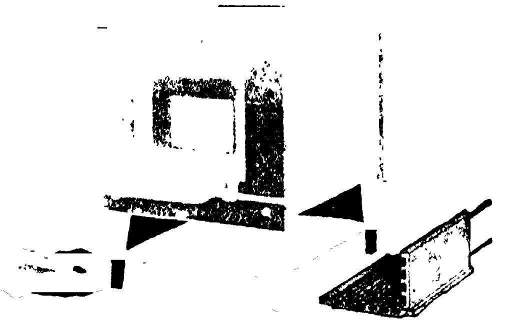
Multiple Replaceable Unit System.



MUFFLE UNITS ARE REVERSIBLE

By means of the Multiple Unit feature of this system, all parts containing the Heat Producing Resistor Coils are independently inserted into the furnace chamber to form a complete Muffle, Crucible or Tube form Being wholly contained in the heating chamber all heat generated is effective, making the efficiency higher than in any other electric furnace.

The Multiple Unit System is patented. Enables the operator to remove the one unit which may have burnt out, thus leaving the other unit or units in the furnace for further service. Any unit, in case of a burnout in the Multiple Unit System, can be easily replaced in five minutes' time by the operator.



STANDARD MUFFLE FURNACE

Types 50, 52, 54 and 56, with one each "Spare" Top (or Bottom) and Side Units Sizes are 3¼" wide, 2½" high, 7" deep inside, 4¼" x 3" x 10", 5¼" x 3¾" x 12", and 7½" x 5¼" x 14".

Incased Rheostat Muffle Furnaces, Types 60 to 66, are same sizes as above but have rheostat incased in base of furnaces (not illustrated).

COMBUSTION TUBE FURNACES

Furnaces of this type, while designed primarily for combustion work, have been used extensively for enameling or hardening tubes, rods, helical springs, etc., and for Pyrometer Calibration.

Hinged combustion furnace, type 70, not illustrated, is hinged so the upper half may be raised for observation, similar to the Organic design illustrated in next column.

Size of each type 1¼" diameter x 12" bore.

STANDARD COMBUSTION TUBE FURNACE, TYPE 77
Shown with one "spare" unit

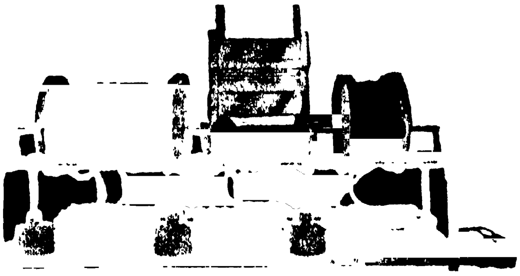
CRUCIBLE FURNACES (not illustrated)

This form of furnace is used extensively for melting small quantities of base metals; for *pyrometer calibration when couples are immersed* in molten salts or metals; and for Decalescent Work in Steel

Catalog "C" describes Multiple Unit Furnaces.

MULTIPLE UNIT ELECTRIC ORGANIC COMBUSTION FURNACE

This apparatus has been designed to replace oil or gas fired furnaces especially for organic combustions.



ORGANIC COMBUSTION FURNACE

Advantages—Each section of the electric furnace, during any one combustion, is used independently in place of groups of Bunsen Burners. Each section is easily moved along the rails to provide for combustion at different points, instead of the use of additional burners of the gas type. The individual switches and rheostats mounted on the base afford a means of operating each furnace independently.

For observation purposes the upper half may be raised without shutting off the heat, exposing the glass combustion tube. No fumes are present. Effective heat insulation. Quickly responsive to all conditions of quick or slow heating or cooling.

The use of this furnace is described in Dr. H. L. Fischer's "Laboratory Manual of Organic Chemistry."

Catalog "B" details the Organic Furnace.

MULTIPLE REPLACEABLE-UNIT HOT PLATES

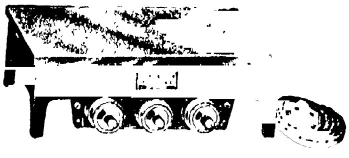
750° F (400° C.) Maximum 160° F. (71°C) Minimum

Compared on a basis of *equal area* of Heating Surface *and Temperature*, the *"next best" use* 16.63% *more current* than *"Multiple Unit"* Hot Plates.

Give temperatures twenty-five per cent, higher than other makes with equivalent current; give the same temperature with fourteen per cent. less current. The units are readily renewable by the operator.

Construction—Steel Bases and Cast Iron Tops. Bases finished in "Optical Black." Top Plate polished surface. Units, two or four in each plate, are moulded "Electrobestos," grooved to receive the heating elements, which are imbedded in a refractory cement. Top plate rests on the units, free from contact with the base, which obviates the loss of heat by conduction. The units rest on bricks of low thermal conductivity, having a conductivity of about one-tenth that of ordinary fire bricks. This forces to the top of the plate a maximum amount of heat generated and affords a comparatively cool atmosphere to the under side of the apparatus. The increased efficiency is a net saving in current cost; gives higher temperatures and quicker maximum heats.

When the Three-Heat Hot Plate is used on 110 volts, the connector plug at the rear may be shifted to the connector pins designed for 220 volts. This "*Shifted Voltage*" gives an additional three heats, making the Hot Plate readily desirable for alcohol extractions, ether evaporation and such similar low temperature work. Similarly, the One-Heat type gives two heats when used on "Shifted Voltage."



MULTIPLE UNIT HOT PLATE

Sizes 4½" x 24"; 6½" x 18", 12" x 12"; 12" x 18", and 18" x 24", with switches on 12", 18" or 24" edge as may be most suited to benches or hoods.

Catalog "A" details Hot Plates.

ELECTRO-CHEMICAL SUPPLY AND ENGINEERING COMPANY

320 Bulletin Building

PHILADELPHIA, PA.

Cable Address ECSEC, Philadelphia

PRODUCTS

The Vorce Electrolytic Cell.
Processes for the Production of Lime or Soda Bleaching Liquors.
Electrolytic Installations.
Chemical Plants and Acid Plants.
DURO Acid-Proof Cement and Brick.

THE VORCE ELECTROLYTIC CELL

The Vorce cell is for the production of Caustic Soda or Potash, Chlorine Gas, and Hydrogen in the manufacture of Lime or soda bleaching liquors, bleaching powder, liquid chlorine, Hydrochloric acid, caustic in any form, lard substitutes, and chlorine products.

Some advantages:

1. Extreme simplicity of construction of all parts resulting in very low costs of construction and upkeep.

2. Small compass, resulting in large production in small floor space, and low cost for housing. One cell of 1000 amperes capacity requires only 15 square feet of active floor space including alleyways and space between cells.

TYPICAL INSTALLATION OF VORCE CELLS

3. Anode construction is such that electrical contact with non-jointed graphite anode is made outside the cell and above the brine level, preventing fouling of the contacts. This joint is accessible for inspection and cleaning, without interrupting cell operation. The direct result is high efficiency and long life of the anode.

4. Current efficiency..............93% to 98%.

5. Light weight..........only 600 lbs. per cell.

6. Very low operating cost.

In pulp mills and textile bleacheries, bleaching solutions may be economically produced which are superior to solutions of bleaching powder.

DURO ACID-PROOF CEMENT

Duro is a fine white powder to be mixed with silicate of soda to the consistency of soft putty. In this form it is ready for use as a cement for laying up acid brick and for other purposes. Duro constructed masonry is found superior to lead for many uses about a chemical plant

Common uses are:

- Acid Towers,
  - Gay-Lussac, Glover, Concentrating, Purifying, Absorbing.
- Acid Tanks,
  - Storage, mixing, leaching.
- Acid
  - Coolers, filters, chutes, fan-casings, chamber floors.
- Any Acid-Proof Construction.

SERVICES

We are specialists in the design and construction of plants for the manufacture of:

Sulphuric acid
Hydrochloric acid
Nitric acid
Phosphoric acid
Liquid Sulphur Dioxide
Liquid Chlorine
Potash Products
Chlorine Products
Electrolytic caustic soda and chlorine
Electrolytic copper and zinc.

CONSULTING SERVICE

We act as consulting engineers in general plant operation, where so desired advising as to the most economical design and general plant efficiency.

Our experience in design, construction, and operation of chemical plants and apparatus will be valuable in the reconstruction of plants now in operation as well as for contemplated projects.

THE ELECTROLABS COMPANY

2635 Penn Avenue
PITTSBURGH, PA.

BRANCHES
New York
Philadelphia
San Francisco
Los Angeles

Cable Address
"ELECTROLAB"
Pittsburgh

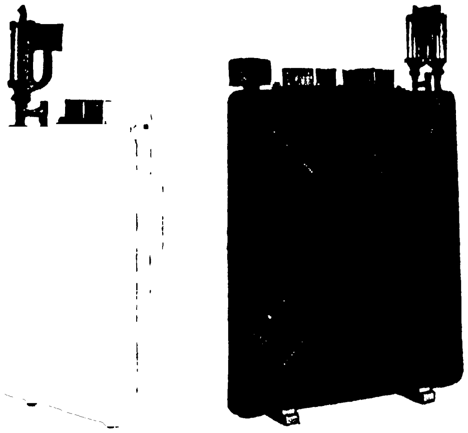
Electrolabs

PRODUCTS

Equipment for complete Oxygen and Hydrogen Generating Plants.

LEVIN OXY-HYDROGEN GENERATOR

Construction—Is of the unit type, being built of a few standardized parts which can be assembled rapidly and accurately.


Type "A" Type "B"
LEVIN OXY-HYDROGEN CELLS

This generator is distinctive in that it is delivered completely assembled and rigidly welded.

The cell consists of three compartments:

Two outer compartments in which oxygen is generated, and a central one in which hydrogen is generated; two sheet metal frames, to each of which is attached an asbestos diaphragm, serve as separating mediums.

The electrodes are independent of the casing, being separated from and securely fixed within it by specially designed blocks of asbestos. The surfaces of both the anode and cathode are cobalt-plated.

All sheet metal used is iron of the highest purity.

Applications—The Levin Oxy-hydrogen generator is suitable for use wherever a supply of oxygen, hydrogen or both of these gases is required.

The Electrolabs System produces oxygen at one-third the price paid for it in cylinders, and in addition furnishes hydrogen as a by-product. This is a conservative estimate in which storage, handling, return of cylinders, bookkeeping, unavoidable 15% loss, etc., have not been included.

Technical Advantages—Some of the features of design and construction that bring about simplicity of routine, freedom from interruption in operation, and efficiency of the generators are:

All materials likely to deteriorate under action of the strong caustic solution (electrolyte), the gases formed, or the electrochemical action consequent upon the decomposition of water have been entirely excluded. This insures the durability of the generator, reduces maintenance and rehabilitation expenses and results in a continuous, efficient, and safe functioning. It is this exclusion of deteriorating materials that makes it possible for **"Electrolabs"** to manufacture a perfect generator.

There are no packing joints, no expenses for maintenance and replacement of packing materials, no bolts to insulate and no leaks to remedy.

Safety—Safety features have received special attention. **The hydrogen and oxygen can not become mixed.** This is evidenced by reports from various installations which show the purity of each of the gases direct from the generator to be 99.8% and better.

REFERENCES

We are pleased to refer those interested in the generation of oxygen and hydrogen gas to the following plants where repeat orders have enlarged original installations

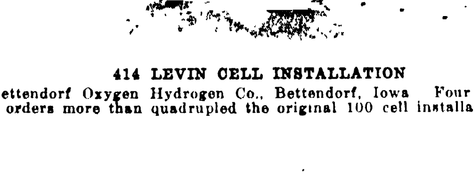
Portland Oxygen and Hydrogen Co, Portland, Oregon - trebled
Cleveland Wire Division of General Electric Co, Cleveland, O, doubled original plant in last two years
General Electric Co, Erie, Pa trebled in two years
Bettendorf Oxygen Hydrogen Co, Bettendorf, Iowa—increased from 100 to 414 cells
Paschall Oxygen Co, Philadelphia, Pa, increased from 800 to 1200
Ohio Chemical & Mfg Co, Cleveland, Ohio—doubled
Consolidated Rolling Mills & Foundries Co., Mexico—doubled

SERVICES

We take the entire responsibility of designing and installing complete plants. The floor space required is no greater than that hitherto required to store cylinders.

A large force of engineers and large manufacturing facilities enable us to guarantee reasonably prompt deliveries of equipment.

We shall be pleased to consult regarding the problems of production and the use of oxygen and hydrogen with anyone desirous of an economical and reliable source of supply. Our experience is at your service.


414 LEVIN CELL INSTALLATION
Bettendorf Oxygen Hydrogen Co., Bettendorf, Iowa. Four repeat orders more than quadrupled the original 100 cell installation.

ELECTRON CHEMICAL COMPANY

Allen-Moore Electrolytic Cells

531 CONGRESS ST., PORTLAND, ME.

IN FOREIGN COUNTRIES

ALLEN ELECTROLYTIC CELL CORPORATION

GENERAL EUROPEAN REPRESENTATIVE Wallace B Phillips, 9 Grosvenor Gardens, London, S W 1
AGENTS FOR FRANCE BELGIUM ITALY AND SPAIN Phillips & Pain, 1 Rue Taitbout Paris

PRODUCTS

Allen-Moore Electrolytic Cell for the manufacture of Chlorine and Caustic Soda.

Complete Electrolytic Chlorine Plants.

Complete Electrolytic Caustic Soda Plants.

ENGINEERING SERVICE

We maintain an engineering organization which is prepared to furnish designs and superintend the erection of electrolytic chlorine and caustic soda plants. The different types of Allen-Moore Cells, supplemented by our engineering organization, enable us to give our clients a balanced and coordinated service.

With the two types of Allen-Moore Cells, our engineers are able to advise the prospective purchaser, entirely without prejudice, as to the best type of cell for his local conditions.

STANDARD CONCRETE BODY ALLEN-MOORE CELL

Distinctive Features—The Standard Concrete Body Allen-Moore Cell, with its distinctive features of accessibility and economy, stands alone in the field of electrolytic cells. Year in and year out commercial service has proved conclusively that the basic principles of this cell cannot be bettered. While minor features of construction have been improved and will continue to be improved, we invite the most rigorous investigation, with full confidence that such investigation will establish the superiority of the Standard Allen-Moore Cell.

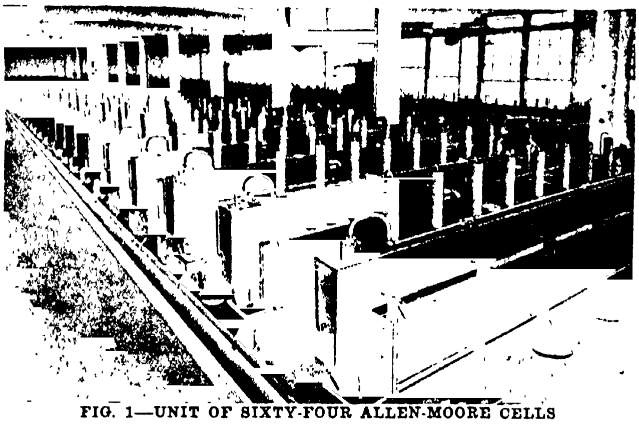


FIG. 1—UNIT OF SIXTY-FOUR ALLEN-MOORE CELLS

Operating Data—This cell is built in three sizes: 300 Amperes, 600 Amperes, 1200-1500 Amperes. The illustrations show the 1200-1500 Ampere Cell.

	1200 Amperes	1500 Amperes
Voltage per Cell	3.8 Volts	4.2 Volts
(Voltages per cell are the average over the complete life of the graphite anode, conservatively stated as twelve months at 1500 amperes, and sixteen months at 1200 amperes.)		
Current Efficiency (Guaranteed)	92%	92%
Voltage Efficiency	60.52%	54.76%
Energy Efficiency	55.67%	50.38%
Production in 24 hours—		
Chlorine	76.9 lbs	96.1 lbs
Caustic Soda	86.8 lbs	108.5 lbs
Salt Consumption in 24 hours	170 lbs	212 lbs
Kilowatt Hours per Pound of Chlorine	1.43 K.W.H.	1.57 K.W.H.

Dimensions and Weight—

Length, 11 ft 2 in., Width, 1 ft 10 in., Height, 4 ft. 6⅞ in.

Approximate weight of cell set up ready for operation, 2,700 lbs

Mechanical Features—The mechanical features of the Standard Allen-Moore Cell, which make for economy and ease of operation, are shown in the accompanying illustrations. Fig. No. 1 shows a unit of sixty-four Allen-Moore Cells. Attention is called to the space between cells, which permits the cell attendant to work unhampered about any part of the cell. Fig. No. 2 shows a single cell with sides closed. Note the simple construction of clamping bars and thorough-bolts, which insures a liquor-tight joint between cathode boxes and concrete body. Fig. No. 3 illustrates the drop side feature of the cell, and shows also the anode construction. For simplicity of design it would be difficult to improve the drop side feature of this cell. Changing diaphragms or repairing anodes on this cell is a matter of minutes, where other types require hours. The construction of the anode is such that a thorough circulation of electrolyte is secured.

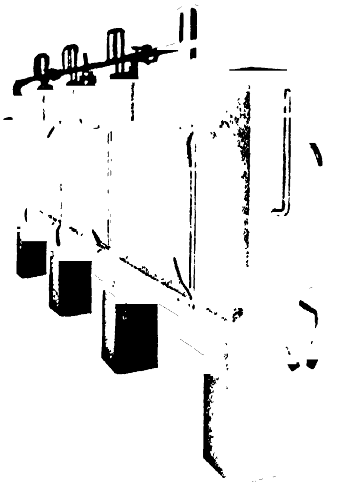


FIG. 2—SINGLE CELL

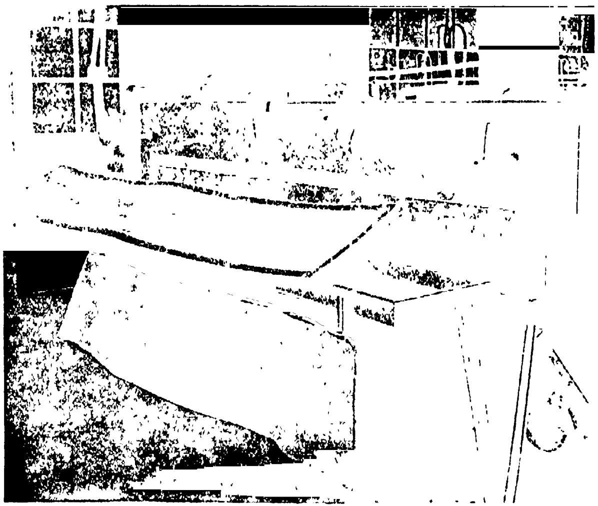


FIG. 3—ILLUSTRATING DROP SIDE FEATURE OF ALLEN-MOORE CELL

Continued on Next Page

TYPE K ALLEN-MOORE CELL

Adaptability—When space or first cost is a factor, or for shipment to remote places, we offer our Type K Allen-Moore Cell, which can be shipped complete ready for assembly. The Type K Cell is made in three sizes—1000 ampere, 1500 ampere, and 2000 ampere capacities. This range of sizes not only enables us to supply the one most economical for the capacity desired, but enables the purchaser to choose a size which will conform to electrical equipment which may be available. This latter fact is particularly of importance in these times when delays in securing electrical equipment are so great.

Operating Data—Operating characteristics are the same as with the Standard Concrete Body Type shown on preceding page.

Dimensions and Weight—	1000 Amperes	1500 Amperes	2000 Amperes
Length	5 ft 5½ in	5 ft 6½ in	8 ft 1 in
Width	13 in	14 in	14 in
Height	38½ in	44½ in	44½ in
Approximate weight of cell set up ready for operation	1000 lbs	1200 lbs	1600 lbs

Mechanical Features—The magnified sections show two of the principal features of the Type K Cell. Illustration No. 7 shows the method of clamping the concrete free-board to the cathode basket, forming a gas- and liquor-tight joint without the use of cement. This feature prevents the possibility of any leakage from the electrolyte chamber into the caustic compartment with its consequent destruction of cathode and deterioration of caustic. Illustration No. 5 shows a cross-section of the basket-shaped cathode, both sides, both ends and the bottom of which are perforated and active. We believe this feature is responsible primarily for the high efficiency and the freedom from cathode hypochlorites which characterize the cell. Furthermore, this basket-shaped cathode permits a maximum of production per square foot of floor space.

The anode follows the standard Allen-Moore design, which insures perfect circulation of the electrolyte.

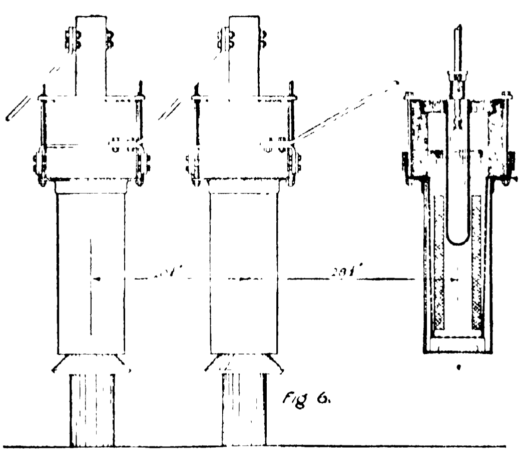


Fig 6.

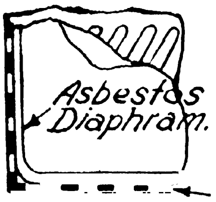


Fig. 5

Ends, Bottom and Sides Are Active Cathode Surface

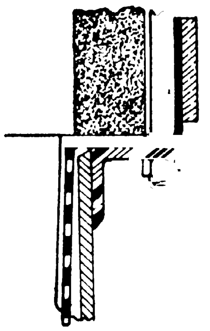


Fig. 7

Pressure Joint Preventing Leakage of Electrolyte

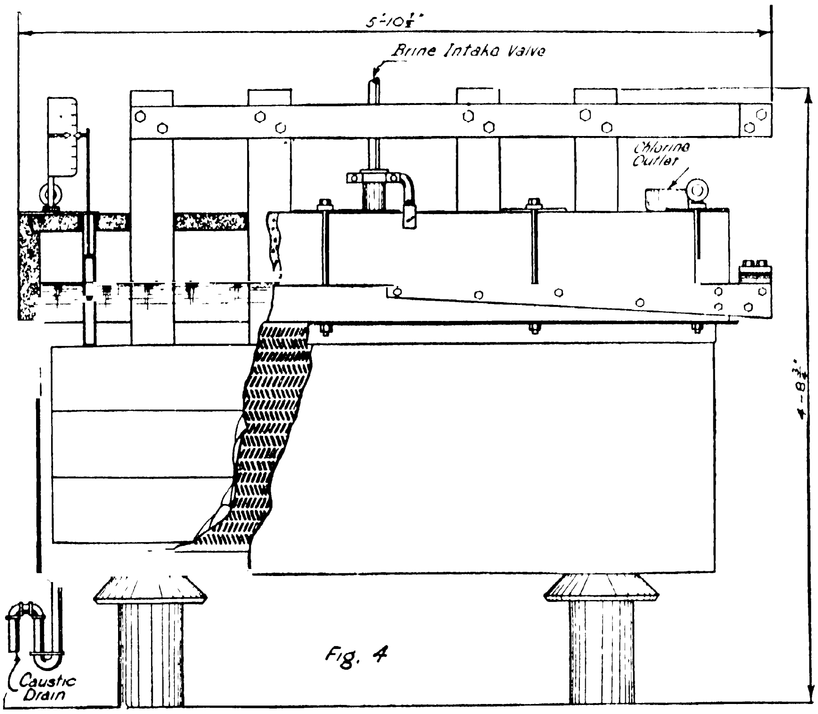


Fig. 4

DETAILS OF CONSTRUCTION TYPE K ALLEN-MOORE CELL

G. H. ELMORE

Colonial Trust Building

PHILADELPHIA, PA.

PRODUCTS

Continuous Centrifugals.

THE ELMORE CONTINUOUS CENTRIFUGAL

Less power—no stopping and starting

Less floor space—because of greater capacity

Less labor—no more than to operate a motor

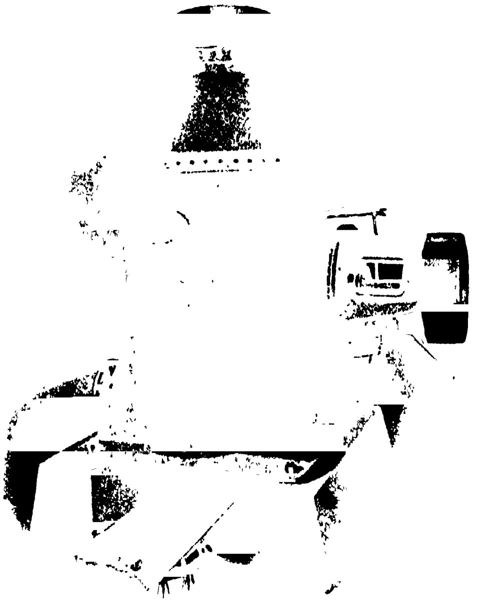
Greater capacity—frequently five to ten times greater than basket centrifugals of the same diameter

The above are the results of continuous operation and are outstanding features of the Elmore Centrifugal. The principle of operation is described fully in the 1920 edition of the Chemical Engineering Catalog

The design permits the use of various metals in construction; screens of different materials and sizes, and baskets of various shapes, all of which assist materially in the solution of difficult problems.

The machines are supplied in four sizes (10, 24, 36 and 48") with capacities ranging from 200 to 3500 cu. ft. per hour.

Fifteen of the 48" machines have been sold for drying coal preparatory to charging to coke ovens. Others of the 10", 24" and 36" machines are in service on apple pumace, maltose meal, phosphate rock, tanning extracts, naphthalene, alkali, ammonium carbonate, boracic acid, and various other chemical products.



ELMORE CONTINUOUS CENTRIFUGAL

The most fundamental applications are in the fields now held by filter presses, vacuum filters and the batch type centrifugals.

All centrifugal and filtration processes at present in use, suffer from one common disadvantage. When the filter begins to work, it also begins to choke. This is not true of the **Elmore Continuous Centrifugal.**

Please give us details of your problem and we will be glad to send you a bulletin and full information.

CAPACITY, HORSEPOWER REQUIREMENTS AND OTHER DATA FOR ELMORE CONTINUOUS CENTRIFUGALS

Type	Inside diam. of conical screen frame at bottom	Maximum capacity in cu ft. per hour	Maximum H. P. required	R. P. M. countershaft	Size of driving pulleys	R. P. M. center spindle shaft	Net weight	Weight boxed for export	Cu ft cargo space	Floor space	Code word
B	48"	3500	35	200-450	30 x 10	397- 893	16000	17300	360	7'-0" x 7'-6"	Ermole
B	36"	1500	20	250-600	24 x 6	605-1452	10250	12000	275	6'-0" x 6'-6"	Lemore
B	24"	800	15	300-700	20 x 6	900-2100	6700	7400	160	5'-0" x 5'-6"	Melroe
B	10"	200	8	500-900	14 x 4	1500-3000	1000	1200	85	3'-0" x 3'-0"	Moerel

THE ELWELL-PARKER ELECTRIC CO.

"Pioneer Builder of Electric Industrial Trucks"

4400 St. Clair Avenue, CLEVELAND, OHIO, U.S.A.

OFFICES IN PRINCIPAL CITIES

PRODUCTS

ELECTRIC STORAGE BATTERY INDUSTRIAL TRUCKS of the Tractor, Elevating Platform or "Self-Loading," Carrier, End Dump, Revolving Crane, Straight and Drop Frame Types. For rail or floor.

APPLICATIONS

Used inside buildings; in yards or across streets; on inclines, elevators, bridges, or through tunnels at steel, tin plate, paper, cotton, textile and lumber mills, clay working, salt, sugar, chemical, automobile, fertilizer, leather, rubber, glass and power plants, foundries, machine shops, factories, hospitals, shipyards, warehouses, piers, railroad and marine passenger and freight terminals for quick, economical inter-department transfer of materials. It matters little what the commodities are, electric trucks can be used to handle them at less expense—first cost, maintenance and adaptability to present manufacturing conditions considered.

OPERATION AND ORIGINAL FEATURES

Elwell-Parker trucks and tractors steer on all four wheels, and are two or four wheel drive. Edison or Lead battery furnishes power to totally enclosed drum type controller and motor. Motor drives through single reduction free coasting worm gear to large diameter solid rubber tired wheels. Battery assembled in a box, may be charged in the truck or removed and charged, or exchanged for one already charged. Battery capacity sufficient for 15 to 20 miles operation, or the average day's work in a factory. Charge from DC or AC line in 7 hours at 40 volts and 40 to 60 amperes.

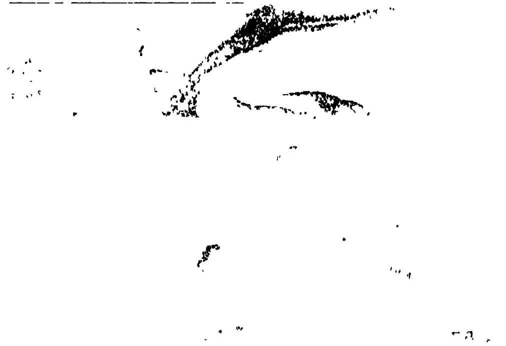
Patent interlocked control is so arranged that truck or tractor cannot be started except when operator is standing on pedals or sitting in seat. This control makes a fuse unnecessary. Motor will take entire battery charge. Power may be applied with brakes partially set—important when starting on inclines. When operator steps from truck same will stop within its length.

Speeds 400 to 700 feet per minute. Carrying capacity of trucks 4000 lbs. Draw bar pull of tractors 6 to 30 tons. Self-loading trucks will pick up 4000 lbs in 10 seconds. Cranes lift 1000 lbs at 28" over side of truck. Dump trucks with 36 cubic foot end dump, and 40 cubic foot side dump bodies. Platform heights range from 11 to 33 inches; platform lengths from 4 to 11 feet; platform widths 2½ to 3½ feet.

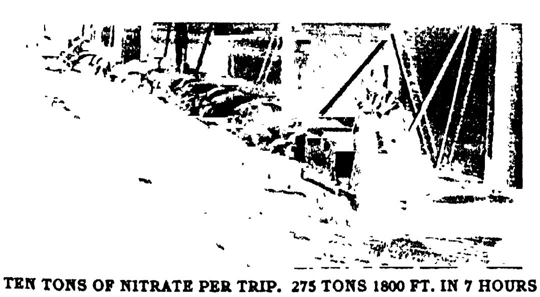
INQUIRIES

When making inquiry, state size and weight of material, amount to be moved per hour or day, length of haul, percentage and length of grade or inclines, and size and capacity of elevators. Give width of passages at shortest turn. State electric current characteristics. Complete catalog on request.

DUMP TRUCK RECEIVING LOAD OF FERTILIZER FROM CONVEYOR



DELIVERING LOAD RIGHT INTO CAR. NO WAITING



TEN TONS OF NITRATE PER TRIP. 275 TONS 1800 FT. IN 7 HOURS

EIGHT CARBOYS OF ACID AT A SINGLE LOAD

THE ELYRIA ENAMELED PRODUCTS COMPANY

ELYRIA, OHIO

New York
101 Park Ave

Pittsburgh
Oliver Bldg

Chicago
Conway Bldg

San Francisco
310 Sansome St

CANADIAN REPRESENTATIVES
Canadian Milk Products, Ltd., Toronto, Ont., Canada

PRODUCTS

Glass Enameled Apparatus.

Glass-lined cast iron chemical equipment.

Stills; Evaporating dishes; Vacuum pans; Autoclaves; Condensers; Boiling kettles; etc.

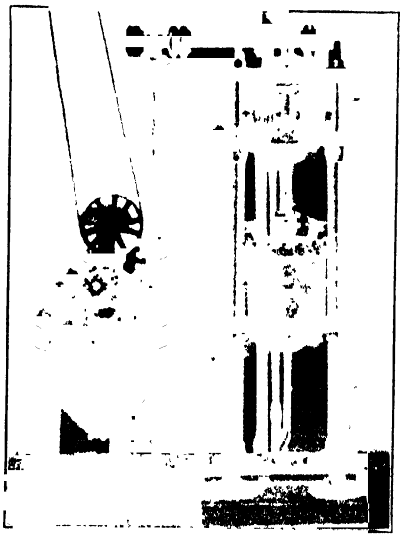
Glass enameled steel equipment for storage, mixing, pasteurizing, boiling, and concentrating purposes in the chemical, pharmaceutical, dairy, canning, packing, beverage, food and other industries.

Steel tanks or cast iron equipment not enameled.

Capacities range from 2 gallons to 7000 gallons.

ACID RESISTANT ENAMEL

Elyria glass enamel has all the acid resisting properties of chemical glass. It contains no metallic oxides. It is fused at high temperatures, making it tough and durable. Elyria enamel has been perfected to give long, continuous service.



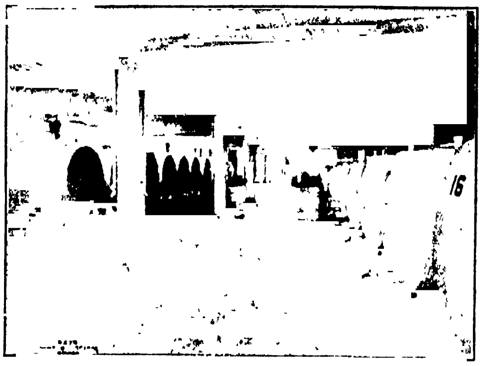
ENAMELED CAST IRON STILL, CONDENSER AND RECEIVER CAPACITIES 2 GAL. TO 250 GAL.

GLASS ENAMELED CAST IRON EQUIPMENT

A standard line of equipment is available, including units for all the usual chemical processes. Elyria glass lined cast iron equipment gives excellent service under most types of acid or other chemical conditions; using pressure or vacuum, steam jacket or the higher oil jacket temperatures.

GLASS ENAMELED STEEL EQUIPMENT

Elyria glass enameled steel equipment is seamless one-piece apparatus. It is suitable for the storage, boiling, mixing or concentrating of many chemical and pharmaceutical products. It has found a wide application in the processing of industrial food products such as oil refining, canning, fruit juice concentration, gelatine storage, dairy products, etc. It is ideal equipment where sanitation and freedom from impurities are desired.



ENAMEL LINED PHARMACEUTICAL STORAGE AND MIXING TANKS

EQUIPMENT NOT ENAMELED

Our high grade seamless welded steel tanks and chemical castings are available for processes not requiring enameled equipment.

ENAMELED CAST IRON TILTING KETTLE HEATED BY AN OIL JACKET

RESEARCH LABORATORY

Our laboratory includes a ceramic department devoted to the maintaining of the high standard of our glass enamels.

The chemical engineering department is equipped with small working units, both enameled cast iron and steel, for working out new processes or for testing out the applicability of our equipment to the customer's process. Consultation is confidential and the service is entirely free.

CATALOGS

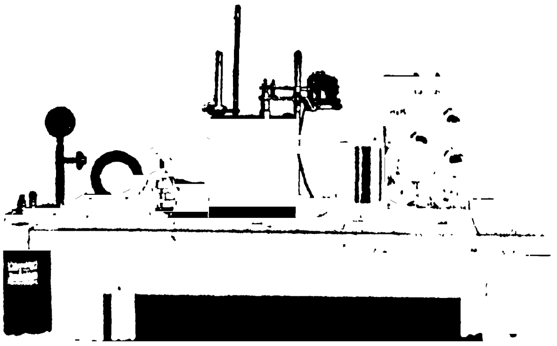
Write to the nearest office for recent literature concerning the uses of our equipment.

EMERSON APPARATUS COMPANY

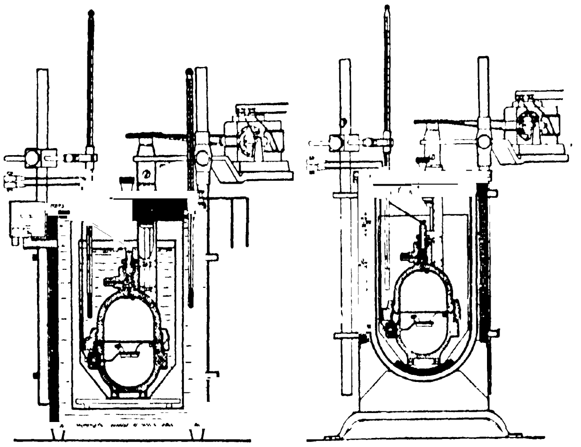
171 Tremont St.
MELROSE, MASS.

PRODUCTS

Industrial Laboratory Apparatus; including: Emerson Calorimeters; Emerson Textile Conditioning Ovens; Rubber Buffing Machines and Viscosimeters.



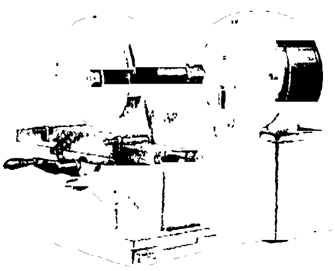
EMERSON FUEL CALORIMETER
WITH SINGLE VALVE BOMB



VACUUM WALLED ADIABATIC JACKET

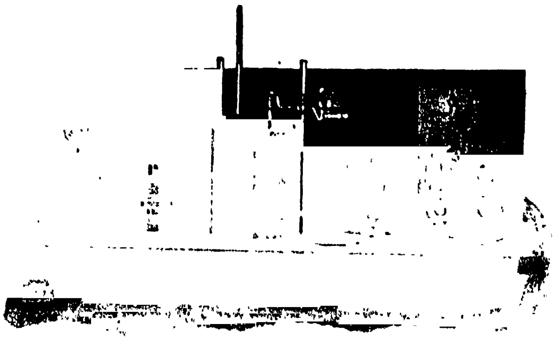
DANIELS' ADIABATIC JACKET

For Emerson Calorimeters



RUBBER BUFFING MACHINE

This machine grinds rubber samples, for tensile strength test, to an absolutely uniform thickness



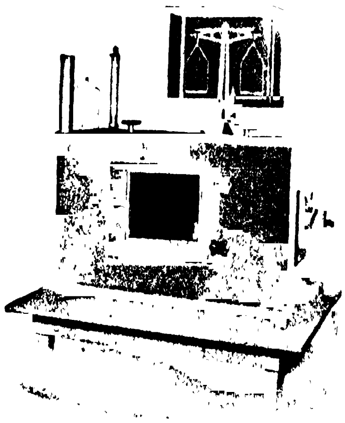
EMERSON CALORIMETER
WITH DOUBLE VALVE BOMB

Both types of Calorimeter can be supplied with Daniels' Adiabatic Jacket.

Only single valve calorimeter can be supplied with Vacuum Walled Jacket

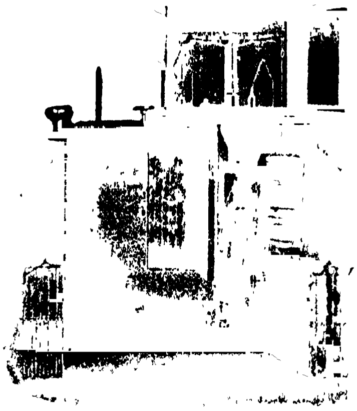
CONDITIONING OVENS

For the determination of moisture in textile products.



EMERSON EIGHT-BASKET CONDITIONING OVEN
Baskets 3" x 3" x 6" deep. Power required, 1000 watts.

Used for testing small samples of textile materials weighing not more than four or five ounces



EMERSON FOUR-BASKET CONDITIONING OVEN
Baskets, 7" x 7" x 18" deep Power required, 2000 watts.

For testing bulky samples of textiles weighing from ¾ lb. up to 1 lb

ESTERLINE AND ANGUS

Engineers and Managers
INDIANAPOLIS, IND.

THE ESTERLINE-ANGUS COMPANY

Manufacturers of Electrical Instruments
1547 LEMCKE ANNEX, INDIANAPOLIS, IND.

THE REPEL-ARC FURNACE COMPANY

Manufacturers of Electric Arc Furnaces
227 E. SOUTH ST., INDIANAPOLIS, IND.

PRODUCTS

Made by The Esterline-Angus Company:

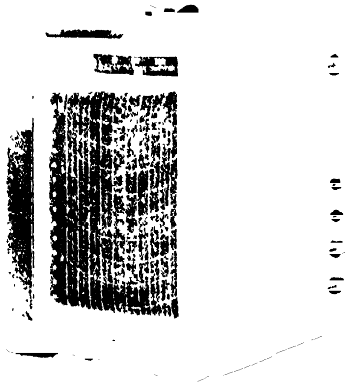
Graphic Recording Instruments, Concentration Meters, Portable Current Transformers, Shunts, Maximum Demand Meters.

TYPES

Graphic Ammeters for A. C and D. C. circuits
Graphic Voltmeters for A C and D C circuits
Graphic Wattmeters for A. C. and D C. circuits
Graphic K. V. A. meters for A. C circuits
Graphic Power Factor Meters.
Graphic Speed Recorders.
Graphic Production Recorders.
Graphic Concentration Recorders.
Graphic Ohm-Meters
Portable current transformers.
Portable concentration indicators.
Portable and switchboard shunts.

USES

For making continuous records of any electrical quantity; testing motor loads, operations of equipment; checking power bills; recording production; recording the resistance or concentration of solutions.



ESTERLINE-ANGUS GRAPHIC RECORDING INSTRUMENT

ADVANTAGES

Can be furnished in wall, switchboard and portable types; chart speed from ¾ to 360 inches per hour; operate one week without attention; stationary ink supply; removable writing mechanism; direct acting, no relays or contacts

CONCENTRATION METERS

Made in both indicating and graphic types for indicating for recording the concentration of solutions and density of electrolytes; regulating blowing down of boilers and detecting leakage in surface condensers using salt water for cooling.

PORTABLE METER

Complete catalog on request to The Esterline-Angus Co. Sales offices in all principal cities.

PRODUCTS

Made by The Repel-Arc Furnace Company:

Electric Arc Furnaces for melting and Refining Ferreous and Non-Ferreous metals.

SIZES

Furnaces of this type are made in four sizes: ⅛ ton, ¼ ton, ½ ton, and 1 ton.

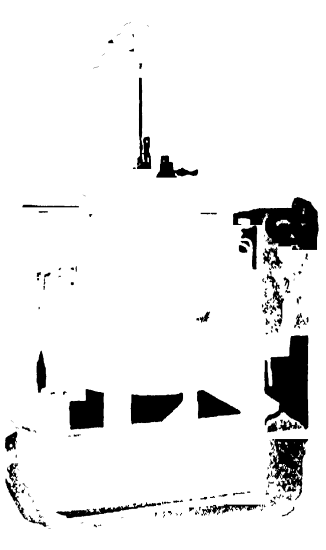
SERVICE

For melting and refining all kinds of ferreous and non-ferreous metals; melting alloys, experimental work.

CHARACTERISTICS

This furnace is automatically self-regulating, requiring no special transformers or regulating auxiliaries. It is made for three phase A. C. and D. C. circuits; Power factor on A. C. circuits 70 to 80. Load is steady and balanced; furnace can be connected to any 220-volt motor circuit.

It is a combined direct-arc and indirect-arc furnace; on account of the self-regulating feature, the arc can be maintained either between the carbons or between the carbons and the molten bath.



REPEL-ARC FURNACE

ADVANTAGES

Three phase; balanced; high power factor, steady operation; simple; no regulating equipment, no special transformers; will melt both ferreous and non-ferreous metals. Charging is done through the roof; very efficient in operation; requires minimum attention.

Complete catalog on request to The Repel-Arc Furnace Co.

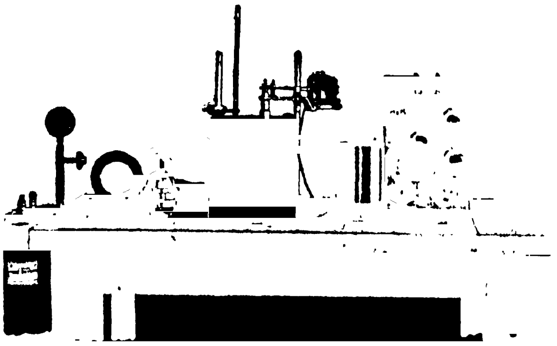
Sales offices in all principal cities.

EMERSON APPARATUS COMPANY

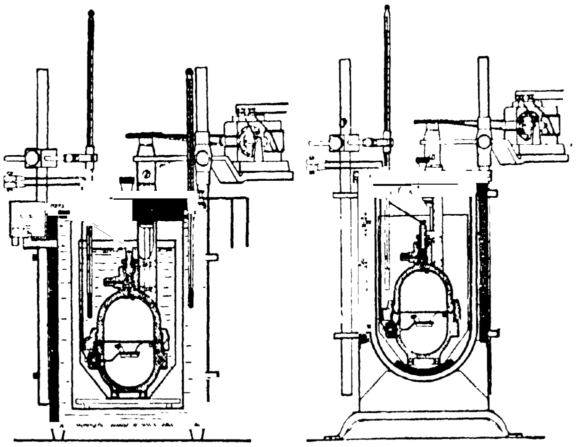
171 Tremont St.
MELROSE, MASS.

PRODUCTS

Industrial Laboratory Apparatus; including: Emerson Calorimeters; Emerson Textile Conditioning Ovens; Rubber Buffing Machines and Viscosimeters.



EMERSON FUEL CALORIMETER
WITH SINGLE VALVE BOMB



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DANIELS' ADIABATIC JACKET

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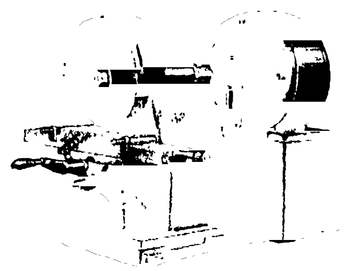

RUBBER BUFFING MACHINE

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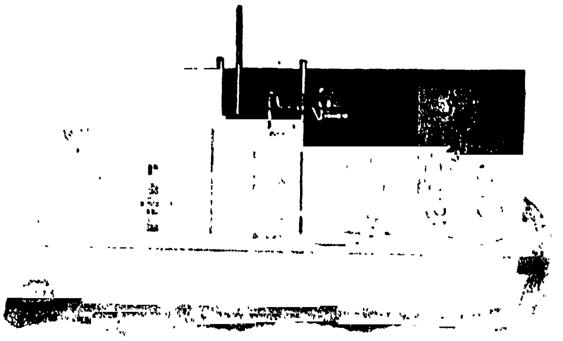

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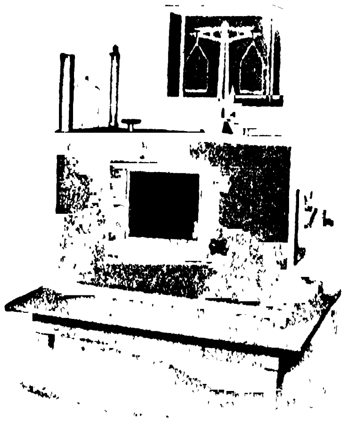

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Baskets 3" x 3" x 6" deep. Power required, 1000 watts.

Used for testing small samples of textile materials weighing not more than four or five ounces

EMERSON FOUR-BASKET CONDITIONING OVEN

Baskets, 7" x 7" x 18" deep. Power required, 2000 watts.

For testing bulky samples of textiles weighing from ¾ lb. up to 1 lb

ESTEY WIRE WORKS COMPANY

Manufacturers of Wire Products

34 Cliff Street
NEW YORK, N. Y.

PRODUCTS

Flexible Conveyor and Transmission Wire Belting.

Wire Cloth, of steel, brass, copper, monel or other metals for all purposes.

Screening apparatus.

Wire products.

FLEXIBLE BELTING

We specialize in flexible belting for various purposes and would be pleased to have conveying problems submitted to us for solution

The advantages of flexible belting are as follows:

It possesses sufficient strength to act as a drive belt as well as a conveying belt

It may be made in any width without a break.

It can be made in any length without lacing or other joint.

A piece of any size may be taken out or inserted at any point without in any way affecting the character of the belt.

It can be made in any mesh, from the fineness of a lady's mesh bag to as coarse as may be desired.

It may be made from any size wire from the finest up to ⅜″ rod if required

It may be made of any kind of metal necessary to resist the action of various materials

It may be used on any size of pulley as its flexibility conforms to the surface and still gives sufficient traction

It is very much cheaper than any other belt of similar utility.

It may be used for drums containing pins or other irregularities.

Its openings permit the free passage of steam, hot air, water or other substances, which are necessary in some classes of manufacture

Repairs can be made at trifling cost by inexperienced workmen. As this consists simply of replacing defective wires with new wires, the belt is made exactly like new These repair wires can be kept on hand at slight expense.

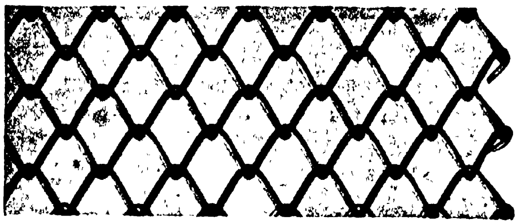
Promptness of delivery could be assured as the same machine could make a wide variety of meshes

The tendency to crawl sidewise, which was formerly caused by the spiral construction of the belt, has been perfectly overcome by a system of reverse twist which keeps the belt perfectly in line without the use of pins or flanges.

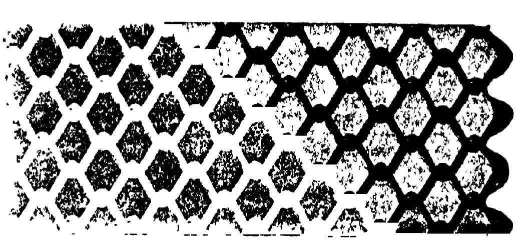
May be used for conveying and screening simultaneously.

We illustrate a few of the innumerable types of belting which we manufacture.

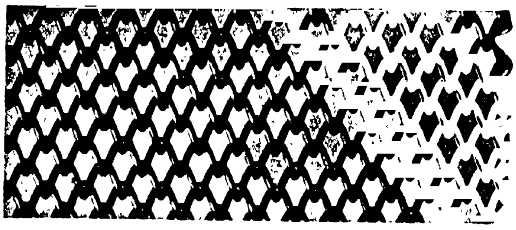
Detailed information will be sent upon request.



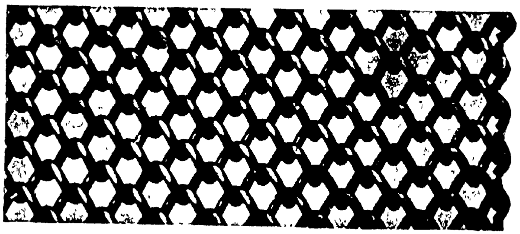
No 318



No. 418



No. 618



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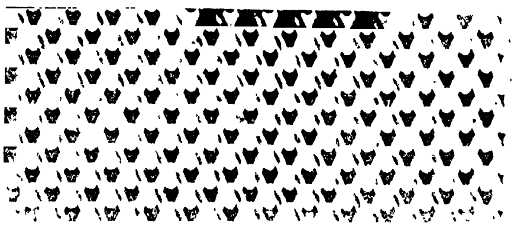


No. 616

FULL SIZE ILLUSTRATIONS FLEXIBLE WIRE BELTING

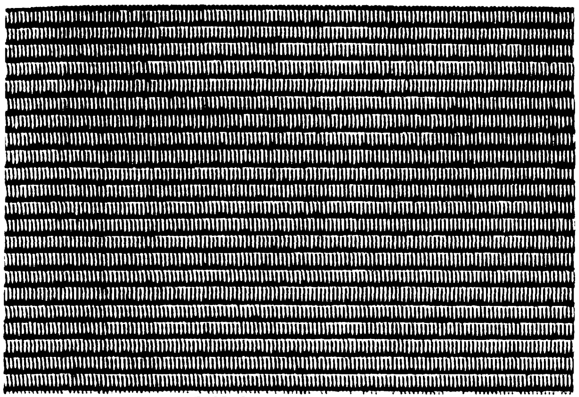
NOTE: The coarsest mesh shown above is three openings to the inch. We can furnish any larger mesh, however, up to six-inch opening and any gauge wire required.

Continued on Next Page

DUTCH WIRE CLOTH

Is made from Steel, Brass, Tinned Brass, Monel Metal or Copper Wire, and in various meshes It is used extensively for filtering purposes in sugar refineries, and the fermentation industries It is made both plain and twilled

This cloth is usually made specially to order, but we carry in stock 10 x 80 mesh and 14 x 120 mesh.



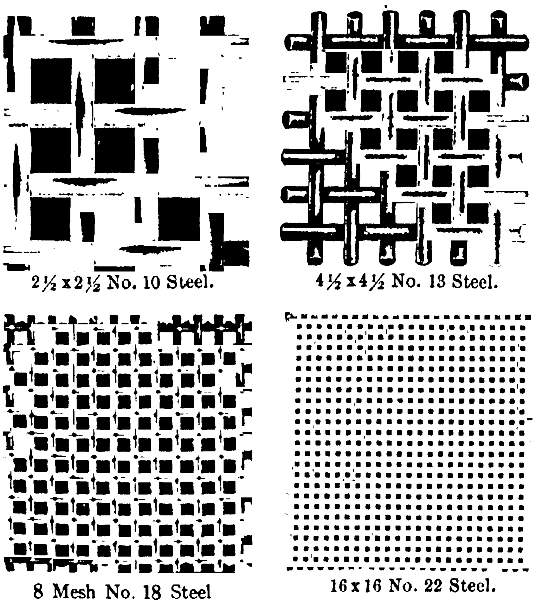
DUTCH WIRE CLOTH
10 x 80 Mesh

ESTEY DOUBLE-CRIMPED MINING WIRE CLOTH

This cloth is made of special wire adapted for the heaviest work in Battery Screens, Jigs, etc It is made of Brass, Copper or Phosphor Bronze

Where the screen comes in contact with acid, Phosphor Bronze Cloth will wear longer than any other material

Our cloth is recommended for its uniform mesh and owing to the fact that the wires are crimped both ways, presenting a smooth surface, it has no equal for use in stamp Batteries and Jig Screens



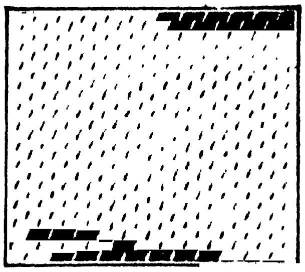
2½ x 2½ No. 10 Steel.
4½ x 4½ No. 13 Steel.
8 Mesh No. 18 Steel
16 x 16 No. 22 Steel.

TYPES OF OUR WIRE CLOTH

FLEXIBLE SPIRAL CLOTH

Flexible spiral cloth in brass or other metal is especially adapted for use with sugar centrifugals, etc. It can be furnished in any mesh or size of wire, and in whatever dimension may be required Prices on application

Brass or iron backing wires will be furnished in any desired width and length Seven and eight mesh are standard.



CENTRIFUGAL CLOTH

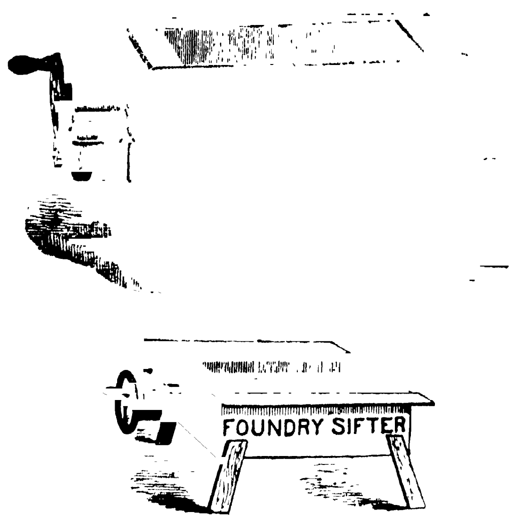
WOOD FRAME SIEVES

Chemists' sieves of all diameters made of brass, copper, steel or other material in all meshes We furnish them with tin, brass or wood frames as desired

S. T. SIFTING MACHINES

These machines are made to be operated either by hand or power They are used wherever material to be sampled and tested must be screened first to uniform size.

We also carry complete laboratory sets of standard testing sieves.



TYPES OF S. T. SIFTERS

STOCK

We carry in stock for immediate shipment steel, copper, copper coated, brass, phosphor bronze, galvanized and tinned wire cloth suitable for any industrial requirement.

EYNON-EVANS CORPORATION

Power Specialties—Brass Castings

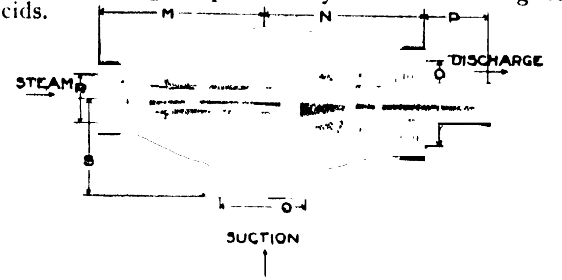
FIFTEENTH AND CLEARFIELD STREETS, PHILADELPHIA, PA.

PRODUCTS

Syphons, Blowers, Compressors and Exhausters, Injectors, Noiseless Water Heaters, Woodlined Valves, Locomotive Gauge Cocks, Acid Resisting Bronze Valves.

SYPHONS

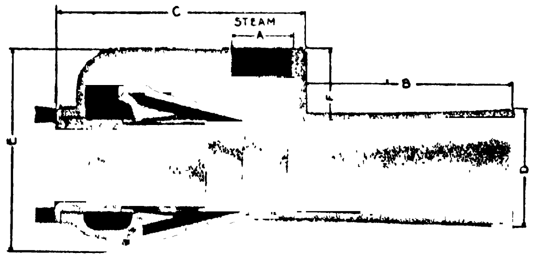
Through twenty-five years of experience in the manufacture and sale of Syphons we have developed a complete line with representative types to meet any requirement of service and each with the proper balance between efficiency and durability. Syphons can be furnished in any size, of brass or iron, with or without couplings or for flanged connection. A lead-lined syphon is designed particularly for the handling of acids.



EYNON-EVANS SYPHON

NOISELESS HEATER

Wherever liquid is heated by direct mixture with steam, our Noiseless Heater offers a most efficient and desirable method of introducing the steam and as the steam discharges through the heater it causes the liquid to circulate with the steam. This action takes up all the steam, circulates the liquid and does it noiselessly.



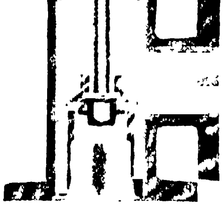
NOISELESS HEATER

COMPRESSOR AND EXHAUSTER

The Compressor and Exhauster uses a steam jet of high velocity to entrain vapors, gases or air and discharge the mixture. It will draw from a vacuum and discharge against pressure. It is a most satisfactory device to prime centrifugal pumps by exhausting the air from case and suction. As a Vacuum pump it is applied to filters, evaporators and stills. As a compressor, it is used for agitation of liquids by discharging compressed air through the liquid.

EYNON-EVANS WOODLINED VALVE

Our Woodlined Valve is designed for service where acidity quickly destroys iron or brass valves. It is built of iron and lined with wood in such a manner that the action of acid on the body of the valve is practically eliminated. The seat and disc are of easily renewable construction.

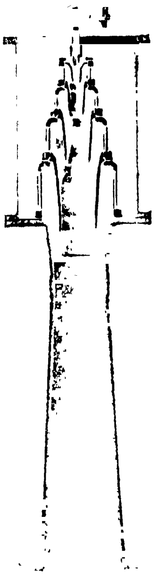


WOODLINED VALVE

EYNON-EVANS JET BLOWER

The Eynon-Evans Jet Blower is best known for its universal application to Gas Producers. Its correctly designed multiple nozzles make a blower of high efficiency. Adjustment of the steam jet and the blast gate permits of a mixture of air and steam in proper proportions to give the blast desired.

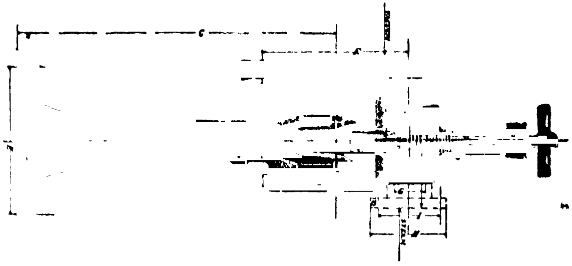
The high efficiency of this blower, together with its extreme simplicity, has brought it into extensive use for forced draft purposes under boilers and furnaces of all descriptions. It is often operated with Compressed air instead of steam where such arrangement has advantages.



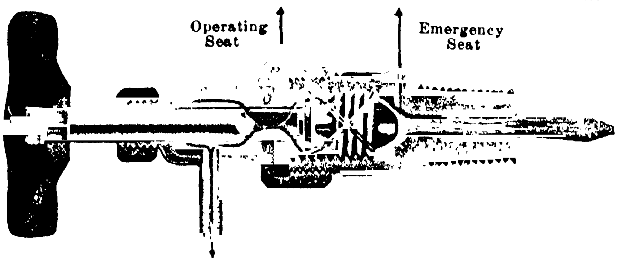
EYNON-EVANS JET BLOWER

LOCOMOTIVE GAUGE COCKS

The Locomotive Gauge Cock which for years has been a Railroad standard. Its application to industrial locomotives is extensive. The operating seat may be renewed with cock under pressure—accomplished by closing the emergency seat and removing the bonnet.



COMPRESSOR AND EXHAUSTER



LOCOMOTIVE GAUGE COCK

FAIRBANKS, MORSE & CO.

Electric Motors, Oil Engines, Pumps

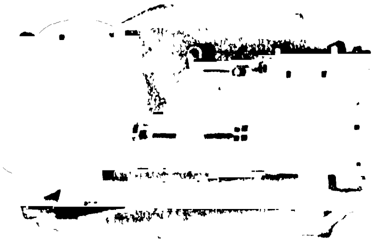
CHICAGO, ILLINOIS

PRODUCTS

Electric Motors; Dynamos; Alternators; Lighting Plants; Starters; etc.; Pumps—Centrifugal, Steam, Power, for every service; Oil Engines, 10 h. p. to 300 h. p.; Marine Oil Engines, 30 h. p. to 300 h. p.; Kerosene Engines, 1½ h. p. to 20 h. p.; Scales, all kinds; Railway Supplies; Motor Cars; Standpipes; Coaling Stations; etc.; Water Systems; Tanks and Towers; Hoists; Air Compressors; etc.

PUMPS

Fairbanks-Morse pumps are made to accommodate practically every pumping need, each type embodying the long experience and familiarity of competent engineers. The application of pumping machinery to the widely varied needs of the chemical industry requires such a diversity of types and sizes that we are only attempting to illustrate a few of the various types adaptable to the uses for which pumps are used in the many branches of this industry.



BOILER FEED AND GENERAL SERVICE PUMP
Sizes 4½ x 3 x 4 ft to 6 x 4 x 6 ft

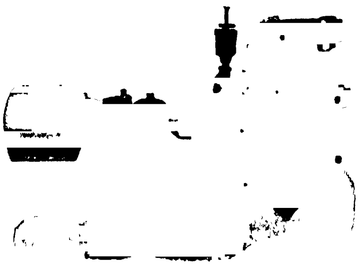


FIG. 505. BELT DRIVEN CENTRIFUGAL PUMP

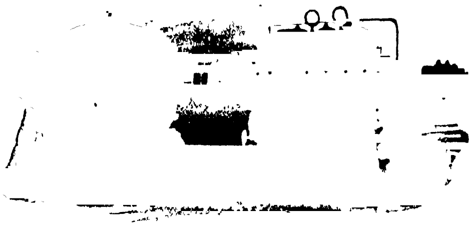
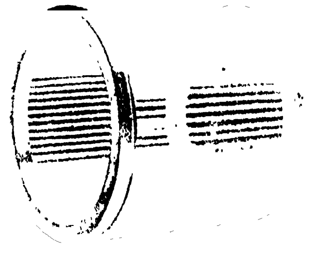


FIG. 1003. 5-INCH, 3-STAGE HORIZONTALLY SPLIT CASING CENTRIFUGAL PUMP DIRECT CONNECTED TO 75 H.P. FAIRBANKS-MORSE INDUCTION MOTOR

MOTORS

Solid Metal Rotor Winding—The rotor winding (over 3 h. p.) is solid metal without joints. There is no solder. No screws or rivets. Nothing to loosen up, spark, flash or burn and impair the motor's power and efficiency. The end rings are cast on solid copper bars in such a way that the metal of the bars and the metal of the rings are fused together in one solid jointless structure. Mechanically and electrically strong.



THE ORIGINAL JOINTLESS ROTOR CAGE
All one piece—no joints

"H" Squirrel Cage Ball Bearing—For alternating current. Ball bearings mean less friction, higher efficiency, proved reliability. "H" motors have grease lubrication, bearings are dustproof; no oil slop. Bulletin 210-B.

"H" SQUIRREL CAGE BALL BEARING MOTOR

"CP" Ring Oiling Sleeve Bearing—For direct current. Commutating pole or interpole type. Either constant speed or adjustable speed for machine tools. Bulletin 27.

"CP" RING OILING SLEEVE BEARING MOTOR

"KBV" Internal Starter—For alternating current. Especially adapted for remote control. Close a switch to start, open it to stop. Switch may be located anywhere. Takes little starting current. May be used where squirrel cage motors would impair the lighting service. Bulletin 210.

"KBV" INTERNAL STARTER MOTOR

ANDREW M. FAIRLIE

Consulting Chemical Engineer
Citizens & Southern Bank Building
ATLANTA, GA.
P. O. Box 358

Cable Address
"FAIRLIE" Atlanta

Long Distance Telephone
IVY 7058

SERVICES

Design of Chemical Plants

I am a specialist in the design, construction and management of sulphuric acid plants.

I give my personal attention to the work of my clients.

I design and supervise the construction and equipment of complete plants, with any desired type of chamber, for the manufacture of sulphuric acid from brimstone, or pyrites, or from the gases of zinc ore or copper ore roasters, or from the waste gases of copper blast furnaces, or copper converters.

I design acid- and weather-proof chemical towers, either all-masonry or lead-lined, as desired.

Plants are designed with a view to durability, low maintenance cost, and economical operation. Many years of operating experience have taught me what kinds of materials and equipment details to use.

ADVISORY ENGINEERING SERVICE

For concerns having their own engineering staff, or desiring to incorporate to some extent their own ideas in a new plant, I render an advisory consulting service.

REMODELING SERVICE

I remodel plants which are operating, inefficiently, and remodel or rebuild old or worn-out plants.

DIAGNOSIS SERVICE

I diagnose the diseases of "sick" acid plants, and apply the appropriate remedies.

ANALYTICAL CONTROL OF THE CHAMBER PROCESS

I offer my patented method of operating the chamber process for making sulphuric acid, introduce same where desired, and train the plant operatives in its use.

MANAGEMENT AND MAINTENANCE SERVICE

I offer a management and maintenance service, supervising operations and upkeep of plant, which can be arranged for by the year.

Some of the largest acid producers in the world find it profitable to retain my services, on an annual basis, year after year.

I have effected economies at operating plants, which have reimbursed my clients many times the cost of my services. References furnished on request.

MILLS-PACKARD CHAMBERS

I am the sole agent for the United States for the Mills-Packard patented water-cooled sulphuric acid chamber. (See page 748.)

DESIGNS FURNISHED FOR:

Acid- and weather-proof towers
Acid chambers
Acid distributing devices
Acid plants, complete
Gas fans and dampers
Gay-Lussac towers
Glover acid coolers
Glover towers
Inter-chamber acid coolers
Inter-chamber towers
Nitrating equipment for acid plants
Packing material for chemical towers
Sulphuric acid plants, complete, any desired type of chamber system
Tanks
All sulphuric acid plant details.

FAWCUS MACHINE COMPANY

Manufacturers of Cut Gears and Special Machinery
2818 Smallman Street
PITTSBURGH, PA.
Co-Manufacturers
DOMINION STEEL PRODUCTS CO.
BRANTFORD, ONT, CANADA
AGENTS
K W Eichelberger, San Francisco, Calif
Catlin Calder Co, Boston, Mass.
Manufacturers Selling Agency, Birmingham, Ala
W G Phillips, Calumet, Mich
L E Meidinger, Milwaukee, Wis

PRODUCTS

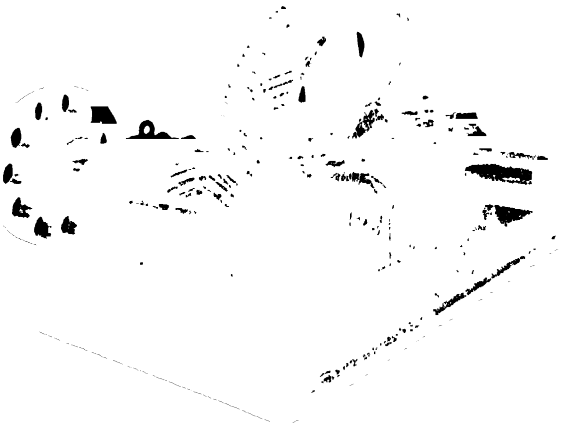
- **Fawcus Herringbone Cut Gears.**
- **Fawcus Herringbone Gear Drives.**
- **Fawcus Herringbone Turbine Transmission.**
- **Fawcus Flexible Couplings.**
- **Spurs, Bevels, Worms, Worm Wheels.**
- **Worm Reductions.**

FAWCUS

Trade Mark

SERVICES

Our engineers, at all times, will gladly advise, recommend and furnish estimates on gear and machinery requirements.



FAWCUS HERRINGBONE GEAR DRIVE

FAWCUS HERRINGBONE GEAR DRIVES

These drives are built in eight standard sizes from 75 horsepower to 1500 horsepower, ratios up to 12 to 1. Special designs up to and including 15,000 horsepower with flywheels if necessary. Double reduction ratios 50 to 1.

HIGH SPEED TURBINE TRANSMISSIONS

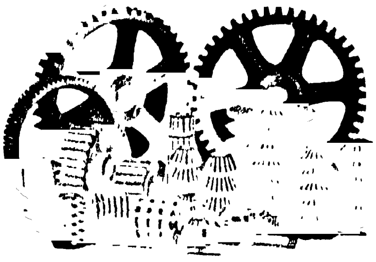
These transmissions are built in twelve standard sizes, 25 horsepower to 1200 horsepower, ratios up to 12 to 1. Turbine speeds up to 4200 R.P.M.

HERRINGBONE GEAR HIGH SPEED TRANSMISSION

FAWCUS HERRINGBONE CUT GEARS

Herringbone gears are cut in solid blanks on **Fawcus Patented** Hobbing and planing machines. Opposite halves of each tooth are machined simultaneously, thereby obtaining maximum accuracy of tooth form, spacing, and alignment. Correct construction demands that the two halves of each tooth be set opposite, the apex of the angle being in the center of the gear face. Face width must be so proportioned that teeth will have overlapping or continuous action. The minimum face width is about six times the circular pitch of the teeth for standard helix angle of 23 degrees

All teeth are cut to diametrical pitch standards 20 degrees involute short addendum.



SPURS, BEVELS, WORMS, WORM WHEELS

Cut gears are all made of the best quality high carbon hammered forgings, cast steel, cast iron, semisteel, brass, bronze, rawhide, fiber, and cut on up to date automatic machines assuring maximum accuracy.

WORM REDUCTIONS

Built in six standard sizes, ratios 15 to 120 to 1. Special designs to suit customer's requirements.

WORM REDUCTION

Send for gear booklet

DAN W. FEITEL BAG COMPANY, LTD.

Manufacturers of New and Used Burlap and Cotton Bags

NEW ORLEANS, LA.

BRANCHES

Chicago
318 E. Illinois St

New York
110 Front St

Cable Address
"FFIBAG," New Orleans

PRODUCTS

We handle Used and New burlap and cotton bags of all descriptions.

FACILITIES

Our facilities are complete in every respect. Our main office and plant is located in New Orleans, where our factory covers an entire square, devoted almost entirely to the reclaiming and manufacturing of Used burlap and cotton bags, with a daily capacity of 100,000. We also have branch offices in Chicago and New York, with all necessary equipment for the quick distribution of our bags in those sections.

CONNECTIONS

The connections we have are in the larger cities of the country, as well as in Calcutta and the principal European centers, permitting us to keep posted on local and foreign markets.

QUALITY

As for quality our bags are known familiarly to the consuming trade as **Feitel-ized Bags,** each and every one of which is first carefully selected, inspected, neatly mended where needed, graded uniform in size and packed, thus insuring 100% service and satisfaction.

SERVICE AND DELIVERY

Service and delivery can be given without unnecessary delay, as we maintain adequate stocks of bags at all times. We have a staff of bag experts always available to assist you in the solution of your bag problems. They know just what bags are required for each purpose. The use of the proper bag is very essential for the promotion of efficiency and economy in the operation of any bag using plant. It is our business to advise you concerning the most appropriate bag for sacking and shipping your products, with the idea of getting the maximum service at the minimum cost.

SPECIALIZING

As we specialize in bags for the Chemical and Allied Industries, we are well prepared to advise you concerning the bag best adapted to your needs. Below are a few of the chemical products now being packed in **Feitel-ized** Bags:

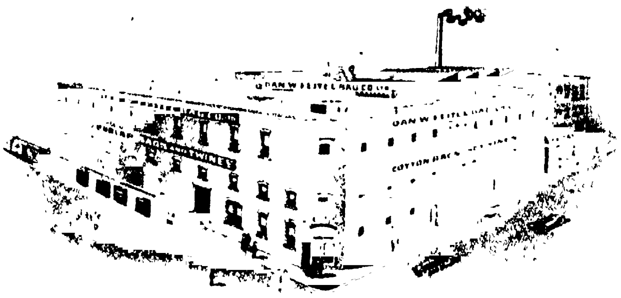
Charcoal,
Sulphur,
Naphthalene,
Silica,
Acetate of Lime,
Fuller's Earth,
Cellulose Acetate,
Cement,
Graphite,
Iron Borings,
Ammonia Sulphate,
Beaten Soda,
Soda Ash,
Cottonseed Products,
Fertilizers,
Nitrate of Soda,
Etc., Etc.

REPRESENTATIVES

Our representatives are constantly traveling throughout the country, and it will please us to have them call upon you to advise concerning your bag problems. Your inquiries in this connection are requested.

ACCUMULATED BAGS

Your accumulation of bags can be converted into money by letting us figure on them for you. We are always in position to pay top prices.



NEW ORLEANS FACTORY AND MAIN OFFICE

FIDELITY CAN COMPANY

FIDELITY

600 S. Caroline Street
BALTIMORE, MD.

BRANCHES
Chicago
New York

PRODUCTS

Tin Cans, both plain and decorated, for liquids, syrups, powders, pastes, greases.

Wooden Boxes, and Box Shooks for tin or glass containers.

SERVICE

We will be pleased to submit sample designs for plain and decorated cans with estimates for making them up in thousand and carload lots.

For the benefit of those using large numbers of cans, yet lacking facilities to store a large reserve supply we will contract to deliver in quantities on a weekly or monthly basis.

PLAIN CANS

We make up plain cans either round, square, oblong or oval with clinched, soldered or double seam bottoms and heads, or with special tops, such as screw, friction or sifting tops. The metal used for our plain cans is of the best quality and is free from rust. Each can is tested under water for leaks with air pressure of five pounds.

DECORATED CANS

We are prepared to supply decorated cans of any size or shape with any of the standard or special tops. Each color is carefully baked before other colors are applied to insure stability of the color.

Care is exercised in making up our decorated cans to prevent scratching the finish.

SPECIALTY CANS

We will confer with manufacturers regarding the best size and shape can. When buying cans consideration should be given to shape for boxing, weight of can as compared with weight of contents, metal consumption and economy. Our experience in these respects is at the disposal of users of metal cans.

QUALITY OF MANUFACTURE

By using only the best tin plate and watching each operation carefully we are able to produce tin cans that will meet the most exacting requirements.

SIZES

We make all sizes from the smallest ointment can up to and including the 5, 25, 50 and 100 gallon sizes.

USES

Our cans are being used by numerous manufacturers for many products, some of which follow:

Paint
Putty
Cements
Dry Colors
Powders
Polishes
Grease
Ink
Molasses
Oysters
Oils
Tea
Pigments
Adhesives
Ointments
Soaps
Spices
Butter
Paste
Lard
Candy
Varnish
Drugs and Pharmaceuticals
Herbs
Syrups
Coffee
Oleomargarine
Tobacco

WEIGHT OF METAL

The tin plate used in making Fidelity Cans is of the proper gauge to withstand pressures of bulk.

STOCK

A large stock of flat sheets of all gauges necessary for can making is kept on hand.

We also maintain a reserve supply of standard sizes and shapes in both round and square cans.

FACILITIES

We have three plants advantageously located to serve our customers, and we are in a position to furnish cans in hundred or carload lots, crated or bulk.

FILTRATION ENGINEERS INCORPORATED

Consulting, Service and Sales Engineers F E INC Products
253 BROADWAY, NEW YORK, N. Y.

PRODUCTS

- Cake Compressor
- Non-Atomizing Wash
- Vacuum Discharge
- Chemical Dryer

FILTER CAKE COMPRESSOR

This device is a new development, on which patents are pending, for the mechanical expression of the moisture from the cake on continuous drum filters.

Advantages Moisture content 50% under conventional operation Spiral wire winding of filter cloth to drum eliminated, no reverse compressed air necessary for aiding discharge of cake, scraper can be located away from surface of filter and still obtain complete discharge of cake Also vacuum pump requirements are cut 80% to 90% over those necessary with customary continuous filter operation

NON-ATOMIZING WASH FOR CONTINUOUS FILTERS

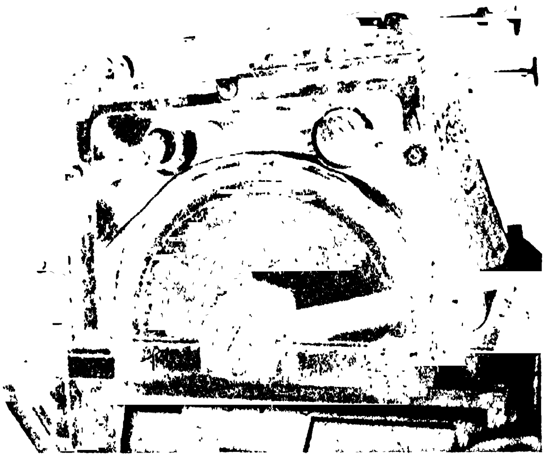
By using an absorbent belt on our Cake Compressor and applying the wash water across the belt from open troughs we are able to more thoroughly wash cakes than is possible with atomized sprays. The water is supplied in excess of the requirements, the excess being collected in a trough located under the lower idler so that none of it contaminates the strong liquor in the tank. We eliminate all "drifting sprays" and plugged up nozzles.

CHEMICAL DRYER

The Dryer, on which patents are pending, consists in reenforcing a conveying screen, made up into a continuous belt, in the compressed filter cake, formed on a continuous drum type filter. The cake so reenforced is conveyable and made to travel through a hot air drying chamber counter-current to the path of the hot air.

This is a radical departure in mechanical dryers, for the material is not fed as a wet cake but as a liquid filter slurry. The fundamental principle employed is a reduction of the moisture content by mechanical means so as to reduce the duty of the dryer on the evaporation of the moisture entering the dryer. Most materials enter the dryer with 50% less moisture than the present day feed to conventional dryers. The high drying efficiency is obvious from the fact that the entire mass of the cake is carried through the dryer at a thickness seldom greater than ½", and the enormous evaporating area thus presented is augmented by the area exposed in the cracks developed by the cake turning pulleys, forming the festoons, etc.

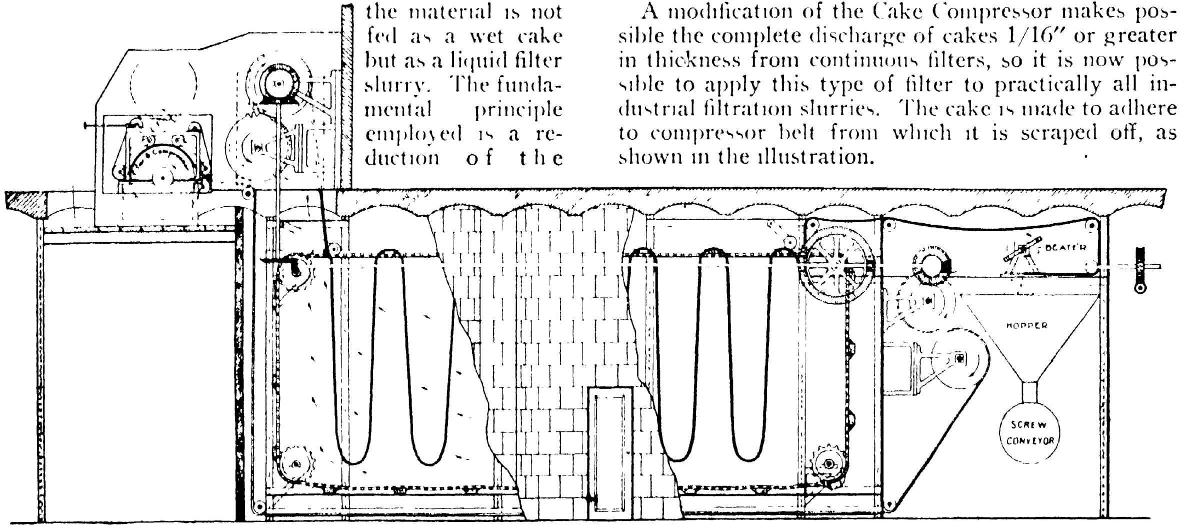
Many of the finest pulverized chemicals, such as ground whiting, 300 mesh plus, have been handled with entire freedom from premature discharge and on no material has more than .1 of 1% of the cake fallen prematurely.



"FEINC" FILTER CAKE COMPRESSOR
Patents Pending

VACUUM CAKE DISCHARGE

A modification of the Cake Compressor makes possible the complete discharge of cakes 1/16" or greater in thickness from continuous filters, so it is now possible to apply this type of filter to practically all industrial filtration slurries. The cake is made to adhere to compressor belt from which it is scraped off, as shown in the illustration.



"FEINC" CHEMICAL DRYER

The design shown is applicable to any existing installation of drum type filters It will be seen that none of the pulleys or compression rollers are driven and in practise the added power required for rotating the filter is undiscernible.

FIDELITY CAN COMPANY

FIDELITY

600 S. Caroline Street
BALTIMORE, MD.

BRANCHES
Chicago
New York

PRODUCTS

Tin Cans, both plain and decorated, for liquids, syrups, powders, pastes, greases.

Wooden Boxes, and Box Shooks for tin or glass containers.

SERVICE

We will be pleased to submit sample designs for plain and decorated cans with estimates for making them up in thousand and carload lots.

For the benefit of those using large numbers of cans, yet lacking facilities to store a large reserve supply we will contract to deliver in quantities on a weekly or monthly basis.

PLAIN CANS

We make up plain cans either round, square, oblong or oval with clinched, soldered or double seam bottoms and heads, or with special tops, such as screw, friction or sifting tops. The metal used for our plain cans is of the best quality and is free from rust. Each can is tested under water for leaks with air pressure of five pounds.

DECORATED CANS

We are prepared to supply decorated cans of any size or shape with any of the standard or special tops. Each color is carefully baked before other colors are applied to insure stability of the color.

Care is exercised in making up our decorated cans to prevent scratching the finish.

SPECIALTY CANS

We will confer with manufacturers regarding the best size and shape can. When buying cans consideration should be given to shape for boxing, weight of can as compared with weight of contents, metal consumption and economy. Our experience in these respects is at the disposal of users of metal cans.

QUALITY OF MANUFACTURE

By using only the best tin plate and watching each operation carefully we are able to produce tin cans that will meet the most exacting requirements.

SIZES

We make all sizes from the smallest ointment can up to and including the 5, 25, 50 and 100 gallon sizes.

USES

Our cans are being used by numerous manufacturers for many products, some of which follow:

Paint
Putty
Cements
Dry Colors
Powders
Polishes
Grease
Ink
Molasses
Oysters
Oils
Tea
Pigments
Adhesives
Ointments
Soaps
Spices
Butter
Paste
Lard
Candy
Varnish
Drugs and Pharmaceuticals
Herbs
Syrups
Coffee
Oleomargarine
Tobacco

WEIGHT OF METAL

The tin plate used in making Fidelity Cans is of the proper gauge to withstand pressures of bulk.

STOCK

A large stock of flat sheets of all gauges necessary for can making is kept on hand.

We also maintain a reserve supply of standard sizes and shapes in both round and square cans.

FACILITIES

We have three plants advantageously located to serve our customers, and we are in a position to furnish cans in hundred or carload lots, crated or bulk.

W. L. FLEISHER & CO., INC.

Consulting and Contracting Industrial Engineers
31 UNION SQUARE WEST, NEW YORK, N. Y.

PRODUCTS

Air Conditioning Systems—Humidifying, Dehumidifying, Heating, Cooling.

Dryers for Solids—Tray, Tunnel, Progressive.

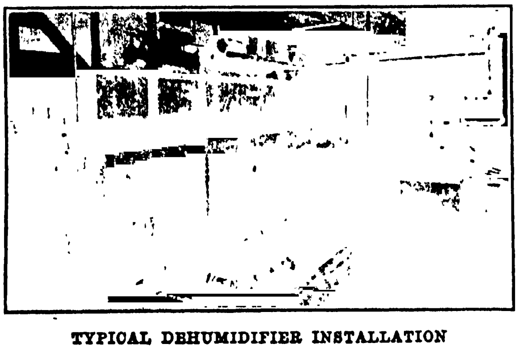
Spray Dryers for Liquids.

AIR CONDITIONING SYSTEMS

Increasing realization of the vital importance of constant atmospheric conditions in candy factories, textile mills, lithographic plants, bakeries, food packing establishments, etc., has resulted in a remarkable demand for Air Conditioning installations.

We are prepared to design and install complete humidifying, dehumidifying, cooling and air washing systems, guaranteed to maintain constant atmospheric conditions, regardless of variation in weather. These insure uniformity of product, maximum all year round production, and prevent both time and weight loss.

Cool Climate and Low Humidity—Casting troubles and graying of the chocolate are entirely prevented in candy factories by a properly designed dehumidifying system, insuring, by fool-proof automatic control, a Cool Climate, with Low Humidity for all Enrobing, Dipping and Packing rooms.

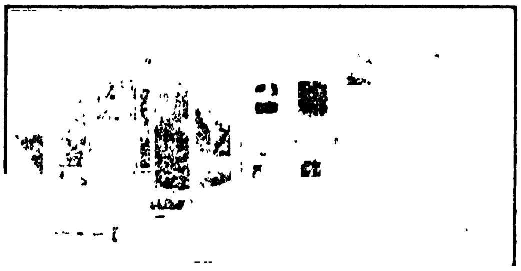


TYPICAL DEHUMIDIFIER INSTALLATION

In Hard Candy work graining is prevented, gumming precluded, and no shut-downs are necessary because of sticky candy and gummed-up machines, when a Moderate Climate with Low Humidity is maintained.

Warm Climate with High Humidity—The proper raising of dough in bakeries demands a Warm Climate with High Humidity. With such a climate delays in "raising" are prevented and maximum production insured, unhampered by hold-ups in the mixing and sponge rooms.

In textile mills, "fly" and thread breaking due to the development of static electricity are prevented by a moderate Climate with High Humidity.



TYPICAL HUMIDIFIER INSTALLATION

Cold Climate with High Humidity—In cold storage work, as well as in yeast and oleomargarine packing and storage, a Cold Climate together with High Humidity is indicated. Such a combination gives maximum cooling with minimum danger from mold and drying out. We install special cold storage units which overcome all objections of the old-fashioned bunker coil systems.

Warm Climate with Low Humidity—For the successful drying of films and plates as well as photographic paper, a Warm Climate with Low Humidity is necessary to overcome emulsion puffing and detachment, and the air supply must be dust free.

SERVICE

Any of the above climatic conditions can be supplied by our patented Air Conditioning systems which are both automatic and fool-proof.

Years of successful engineering in this type of work enable us to recommend, design and install highly efficient, economical equipment, guaranteed to maintain both the temperature and the humidity required.

A completely equipped chemical and engineering Laboratory in charge of highly trained specialists is maintained for the exclusive use of our clients, and before any installation is designed, a carefully conducted test under plant conditions is invariably made.

In addition, our experts are always ready to collaborate with those of our client, and the success of the actual installation is safeguarded by every precaution known to technical science.

REFERENCES

We are prepared to submit references from a wide variety of industries, now equipped with our Air Conditioning systems and to arrange for personal inspections at plants where our installations may be seen in daily operation.

Continued on Next Page

SPRAY DRYERS

In response to the persistent demand for an efficient and economical Spray Dryer, we have perfected and patented a dryer which will recover 100% of the solids contained in any solution, suspension or emulsion.

Materials of the most viscous nature as well as those having the characteristics of partially sun dried humus are spray dried quite as successfully as thin liquors.

ADVANTAGES OF THE SPRAY DRYING PROCESS

Heretofore, it has been necessary for manufacturers to dry their products by carrying on the preliminary concentration in a single or multiple stage Evaporator, with subsequent transfer to a Vacuum Dryer for completion of the process. This was inevitable in the case of material which had to be dried at low temperatures, because of the danger of burning or coagulation or because low boiling point volatiles were apt to be driven off.

Such materials may safely be dried in the Fleisher & Company Spray Dryer, because the drying temperature is no higher than that maintained in Vacuum Evaporators generally.

Thermostatic control throughout makes the operation of the Fleisher & Company Spray Dryer automatic, thereby insuring a uniform product.

Work rooms are kept free of dust because of the slight vacuum maintained in the drying chamber.

Additional units can be added without interfering with the operation of units already installed.

The Fleisher & Company Spray Dryer can be adapted to the space available, is fool-proof, not subject to the operating weaknesses of the vacuum dryer and is a one-man machine.

POWDER CHARACTERISTICS

Waters of crystallization can be entirely removed from practically all salts. Any percent of residual moisture may be left in the dry product; e.g., 12% in starch. Case hardening is prevented. The size of the dry powder particles can be varied within limits.

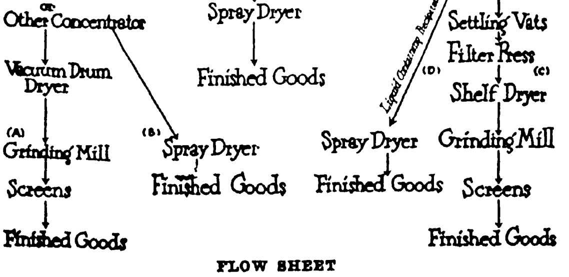
PLACE IN INDUSTRY

Typical uses for Spray Dryer installation together with the saving in supplementary apparatus are shown in the accompanying Flow Sheet.

Steps marked A show the usual manufacturing procedure when a Vacuum Drum Dryer is used.

Apparatus which may be saved by taking the liquids directly to the Spray Dryer from the Vacuum Pan is shown in B.

If the technical treatment involves a Filter Press, as indicated in C, the use of the Spray Dryer after the Precipitation Vats saves the use not only of Settling Vats and Filter Press, but Shelf Dryer, Grinding Mill and Screens as well. See D.



FLOW SHEET

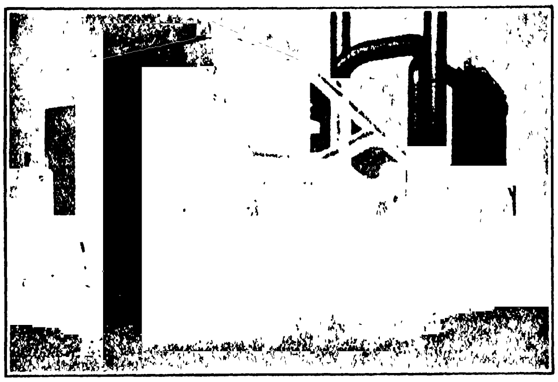
Liquids for which there is no need of either Precipitation Vats or Concentrators can be sent through the Spray Dryer directly. See E.

The saving in first cost through the installation of the Spray Dryer is not only considerable, but the subsequent saving in labor, energy and time of manufacture is, by comparison, enormous.

SPRAY DRIED PRODUCTS

Among the various products which have been successfully dried in the Fleisher & Company Spray Dryer under plant conditions may be mentioned:

Orange Juice, Fruit Pectin and Lemon Juice, Potato and Banana Flours, Coffee as well as various coffee substitutes, Whole Egg in addition to Egg Albumen and Egg Yolk, Soups and Bouillons, both Whole Milk and Skim Milk, Molasses, Sugar, Lake Colors and Aniline Dyes, various Soap Powders, Starch, several Insecticides, Sulphite Pitch, Tannic Acid, Gallic Acid and Boric Acid, Precipitated Chalk, Lead Arsenate, and a wide variety of Sulphates, Acetates, Nitrates and Chlorides.



SPRAY DRYER INSTALLATION

A considerable number of pharmaceutical extracts containing low boiling point volatiles have been dried very successfully in the Fleisher & Company Spray Dryer and the resulting dry powders have not only been shown to be remarkably stable, but in several instances have been pronounced by the trade as distinctly superior to any dried powder product now on the market.

Waste liquors from a variety of chemical industries have been spray dried by W. L. Fleisher & Co., Inc., and at such a low cost as to permit of the conversion of noxious waste elements into a dry, compact, odorless and frequently valuable by-product.

ENGINEERING SERVICE

A commercial size Fleisher & Company Spray Dryer is maintained at our testing laboratory for the free use of our clients and actual plant conditions are duplicated there for long, continuous runs. Complete engineering data is secured for every product and an estimate covering cost of installation and cost of drying per pound under conditions obtaining in our clients' plant are furnished gratis. No so-called "standard sizes" are made, but in every case the Fleisher & Company Spray Dryer is designed to fit the specific needs of the manufacturer.

COVERING PATENTS

The entire process and apparatus of the W. L. Fleisher & Co., Inc., system of Spray Drying are covered by broad basic patents already granted and complete protection thereby assured.

FLETCHER WORKS

Incorporated

FORMERLY SCHAUM & UHLINGER

Centrifugal Extractors

Glenwood Avenue and Second Street

PHILADELPHIA, PA.

PRODUCTS

Centrifugal Dryers, Extractors and Clarifiers for sugar plantation mills, Refineries, Beet Sugar Factories; Salt, Coke By-Product, Chemical and Textile Plants.

Centrifugal Dryers are used extensively for Sugar, Salt, Ammonium Sulphate, Anthracene, Naphthalene, Aniline Salts, Salicylic, Carbolic, Picric, Citric and Sulphonic Acids; Camphor, Glauber's Salt, TNT, Sodium Carbonate and Bicarbonate, Copper Sulphate, Silver Nitrate, Dyes, Starch, Terpene Hydrate, Hydroquinone and other chemical products.

Extractors for the Textile Industry for drying fibers and fabrics of all kinds.

Clarifying Centrifugals for precipitating suspended solids.

These machines save space, avoid the use of settling tanks and in many cases do away with filters and effectively expedite manufacturing processes.

Fletcher Multi-Cone Friction Clutch.

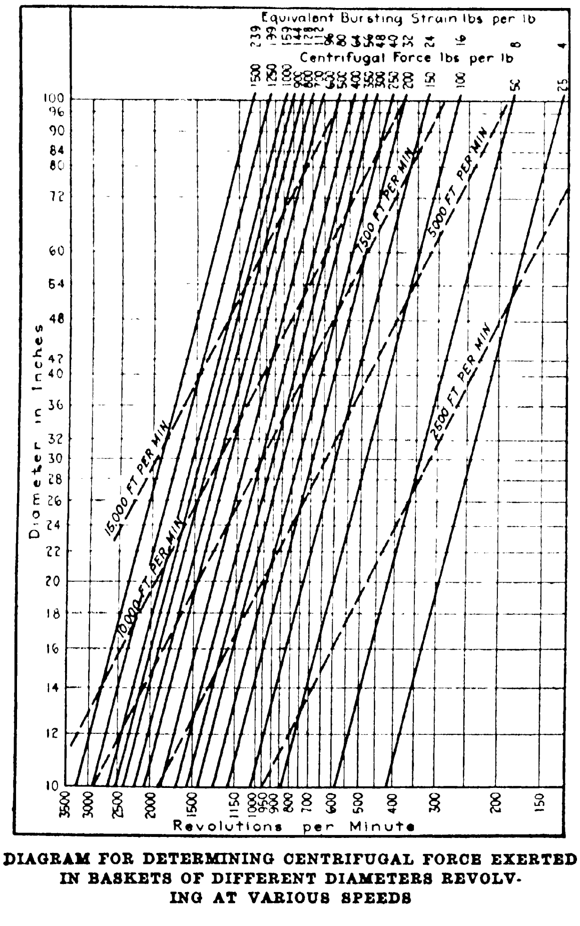


DIAGRAM FOR DETERMINING CENTRIFUGAL FORCE EXERTED IN BASKETS OF DIFFERENT DIAMETERS REVOLVING AT VARIOUS SPEEDS

SALIENT FEATURES

Simplicity of design, and use of the best material obtainable make our centrifugals thoroughly reliable in operation. Correct proportions, ample bearings and reliable oiling arrangements are reasons why our machines are so long in service. We build machines not only to a wide range of sizes, but in a number of different types to meet various requirements.

CENTRIFUGAL FORCE FORMULÆ

NOMENCLATURE

A = Sectional area in square inches
d = Diameter in inches
F = Centrifugal force in pounds
g = Acceleration due to gravity = 32 16 ft per second
H = Centrifugal head
N = Number of revolutions per minute
R = Radius in feet
S = Tensile strain in pounds per square inch
V = Velocity in feet per second = 1/30 N π R
V_1 = Velocity of outer surface of revolving liquid
V_2 = Velocity of inner surface of revolving liquid
V_3 = Velocity in feet per minute
W = Weight in pounds
π = 3 1416

FORMULA FOR CENTRIFUGAL FORCE

$$F = \frac{WV^2}{gR} = \frac{WV^2}{32\ 16R} = \frac{W4\pi^2RN^2}{3600g} = \frac{WRN^2}{2933} = 0003410WRN^2 = 00001417WdN^2$$

FORMULA FOR TENSILE STRAIN IN REVOLVING BANDS

(Due to their own weight)

$$S = \frac{00001417WdN^2}{6\ 2832A} = \frac{000002255WdN^2}{A} = \frac{V^2}{3} \text{ times constant}$$

Constant for	Copper	= 0000.332
" "	Steel	= 0000294
" "	Wrought Iron	= 0000288
" "	Cast Steel	= 0000270
" "	Wood	= 00000225

LABORATORY CENTRIFUGALS

12-INCH LABORATORY CENTRIFUGAL

Our laboratory centrifugal combines the advantages of three separate machines in one. It can be used as a self-balanced machine with perforated basket, or as a rigid bearing machine with solid wall basket for separating liquids of different densities; or fitted with a bottle holder it is used for precipitating samples in bottles. Although baskets and bottle holder are securely fastened to spindle when in use, the changes can be quickly made. Baskets of standard size are 12″ diameter, 6″ deep, with wall capacity of 360 cubic inches. Total capacity 660 cubic inches. Construction throughout is of sturdiest type. All parts are interchangeable. Base plate machined for A. C. or D. C. motors.

"TEXTILE TYPE" EXTRACTORS

This type extractor, with bottom discharge feature, is popular for various lines of chemical manufacture. It gives thoroughly satis-

MOTOR DRIVEN CENTRIFUGAL WITH BOTTOM DISCHARGE

Continued on Next Page

factory service in removing excess moisture and liquor from naphthalene and other coal tar products; nitrocellulose; hydroquinone; sulphonic acid and various other materials.

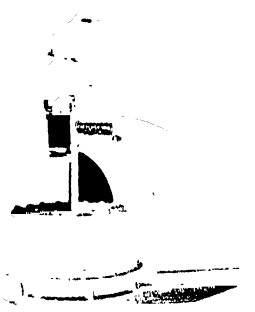
26" UNDERDRIVEN CENTRIFUGAL WITH VERTICAL MOTOR

These machines are made in six sizes, 30", 36", 42", 48", 54" and 60", with six methods of driving: Type A, side engine with friction cone; Type B, direct connected top engine; Type C, belt drive with friction cones; Type E, direct connected electric motor; Type G, side engine with planed gears, and Steam Turbine Drive.

This type extractor is built with or without bottom discharge. They are fitted with baskets of steel, plain, galvanized or rubber coated; or with copper baskets, plain or tinned. The curb is lined with sheet lead or rubber when required. The extractors are self-contained. Construction permits basket to be emptied of its load at any point.

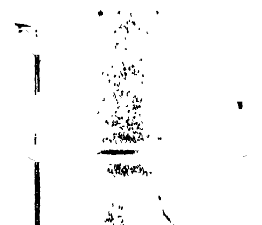
SUSPENDED AND UNDERDRIVEN CENTRIFUGALS

Fletcher Works heavy duty, bottom discharge centrifugals, both of the suspended and underdriven types, are the most extensively used machines of their kind for drying ammonium sulphate, naphthalene and other coke by-products in this country. They are of very strong construction and exceedingly durable. They are built for steam turbine, belt, electric motor or water turbine drive. Equipped with ball bearings throughout, or with ball thrust and bronze bushed radial bearings. Lubrication is ample. Baskets are built of steel, copper or bronze. Curbs are lined with lead or copper if specified. An effective brake with easily removable asbestos lining is provided. Standard size of baskets is 40". Average capacity, 8.33 cubic feet; wall load, total capacity, 17.5 cubic feet.



40" SUSPENDED CENTRIFUGAL WITH STEAM TURBINE DRIVE

For the suspended type centrifugal we have developed a steam turbine drive which has all the advantages of the electric motor without its attendant danger of causing explosions in coke by-product plants. The turbine is as economical in operation as a steam engine, and eliminates entirely belt troubles and expense. Turbine is entirely enclosed. No belts or open parts. Speed is closely regulated by reliable governor which is totally enclosed and free from tampering. Effectively lubricated and oversized ball bearings insure a light running machine and low power consumption. There are no packing boxes to stuff, no slide valves or piston rings to wear, or bearings to be taken up. There being no "dead center" as in a steam engine, the centrifugal can be started by simply turning on the steam and the basket quickly brought to speed without undue vibration. The turbine is not injured by a surge of condensed water coming over from the steam line, either when starting the centrifugal or while running at full speed. All parts being enclosed, there is no possibility of the turbine throwing oil.



40" UNDERDRIVEN CENTRIFUGAL

FLETCHER WESTON SUGAR CENTRIFUGAL

For the underdriven centrifugals we build a special horizontal steam engine for use where an electric motor would be objectionable because of corrosive or explosive vapors.

SUGAR CENTRIFUGALS

A suspended, ball-bearing machine with bottom discharge. The ideal machine where large quantities of granular material, such as sugar or salt, are to be handled. Mixer tank is equipped with stirrers, valves, brakes and clutches all designed in ample size for continuous operation. These centrifugals are usually mounted in batteries; can be discharged mechanically or by hand.

Built with 30", 36", 40" and 48" baskets.

Centrifugal force of approximately 550 times gravity is developed.

Baskets take 4.5 cubic feet, 6.5 cubic feet, 9 cubic feet and 10.8 cubic feet per charge respectively.

Baskets built of steel or bronze, with flat or sloping bottom, or self-discharging bottom.

Driven by belt, direct connected electric motor, hydraulic or steam turbine.

CENTRIFUGALS FOR SPECIAL PURPOSES

We are frequently called upon to design machines to meet special conditions; and to make machines of special designs furnished by our customers. Our long experience in the manufacture of centrifugal machinery, together with our shop equipment and engineering force, enables us to give the best of satisfaction.

We solicit inquiries regarding the adaptability of our centrifugal machines to various processes, and will test materials and give our best advice without obligation on the part of those making the inquiry.

REAR VIEW SUGAR CENTRIFUGAL

FLINN & DREFFEIN COMPANY

431 So. Dearborn Street, CHICAGO, ILL.

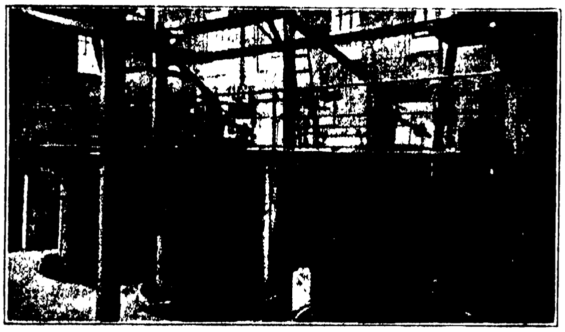
PRODUCTS

Designers and Builders of Industrial Fuel Equipment:

Anthracite Producer Gas Plants
Bituminous Producer Gas Plants (Raw)
Bituminous Producer Gas Plants (Clean)
Mechanical Gas Producers
Gas Washing Apparatus
Tar Extractors
Raw Producer Gas Burners
Special Gas Apparatus for Making:—
Nitrogen, Carbon Monoxide, Carbon Dioxide.

ANTHRACITE PRODUCER PLANTS

This type of apparatus is built for soldering tin cans, canning, etc Also for hardening, tempering, annealing and heat treating of steel

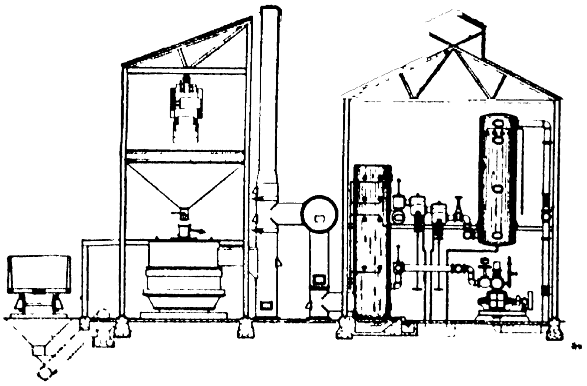


ANTHRACITE PRODUCER PLANT

Furnishing gas for bright annealing cold rolled steel, sherardizing, japanning and various operations formerly using city gas

CLEAN BITUMINOUS PRODUCER PLANTS

This apparatus finds its field in factories where heating operations are widely scattered and at considerable distances from the gas plant. It is the cheapest industrial fuel gas available and may be applied to almost every heating operation, as well as for gas engines

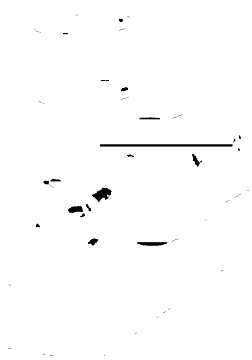


GAS CLEANING PLANT

In connection with a large Bituminous Producer installation.

RAW PRODUCER GAS BURNERS

These burners can be applied to furnaces using fuel oil, coal or coke with virtually no material alterations Combustion is complete within the furnaces and there are no objectionable fumes or smoke emitted Furnaces are readily adapted to the use of the raw producer gas burners.



FLINN & DREFFEIN RAW PRODUCER GAS BURNER

For displacing oil, natural gas, coal and coke in a wide range of industrial heating operations.

RAW BITUMINOUS PRODUCER GAS PLANT

This apparatus is especially suitable for heating reducing kettles, ovens, etc , as well as in all moderate temperature, direct fired furnaces, such as hardening, tempering, annealing and heat treating of steel

RAW BITUMINOUS PRODUCER GAS PLANT

In combination with a complete burner system for heating a double battery of asphalt stills.

SERVICES

For more than ten years, the Flinn & Dreffein Company has designed and built fuel equipments for industrial and manufacturing purposes, covering the entire range of heating and burner operations, and is in a position to offer only that equipment which is suitable to the manufacturer's needs. Fuel systems of its design can be seen in successful operation in many leading factories throughout the country.

INFORMATION REQUIRED

In the nature of things, nearly every proposition must be specially considered before definite recommendations can be made regarding the apparatus involved. In writing, please describe as fully as possible the requirements, giving kind and quantity of fuel used and nature of heating operations to be performed.

FORD CHAIN BLOCK CO.

Hoists and Trolleys

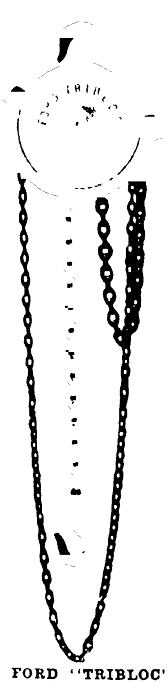
SECOND AND DIAMOND STS., PHILADELPHIA, PA.

PRODUCTS

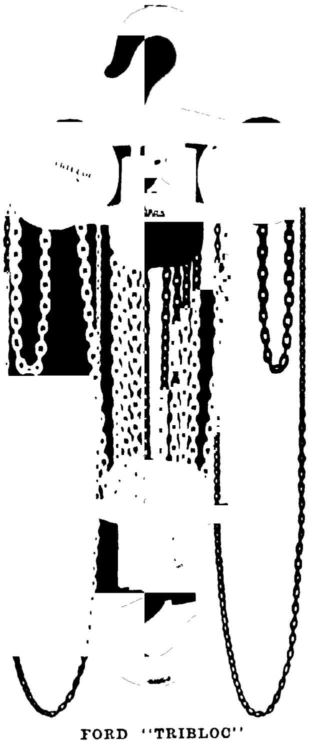
Spur Gear Chain Hoists, Differential and Screw Hoists, Plain and Geared Trolleys.

FORD "TRIBLOC" HOISTS

Advantages—Among the advantages peculiar to the Ford "Tribloc" hoists are the following: the parts are simple and few; the gears are centered on the main bearing, producing balanced gear pressures; the gears are made of steel, covered by an independent dust-proof steel case; all other working parts are made of steel, including the hooks, chain and swivel, which are made of forged steel.



FORD "TRIBLOC"
½ to 2 tons



FORD "TRIBLOC"
12 to 20 tons

"TRIBLOC" CHAIN HOISTS

No.	Capacity		*Hoisting distance		Reaching distance		Distance between hooks		Net weight		Chain pull to lift full load		Code word
	ton	t.	ft	m	ft in	cm	in	cm	lb	kg	lb	kg	
1	½	0.45	8	2.4	9 3	282	13	33	53	24	62	28	ALLEG
2	1	0.91	8	2.4	9-5	287	16	41	80	36	82	37	ALJOY
3	1½	1.4	8	2.4	9-7½	305	18	46	124	56	110	50	ALGOT
4	2	1.8	9	2.7	11 0	335	21	53	188	85	120	54	ALBOD
5	3	2.7	10	3.1	12 8	386	32	81	200	91	114	52	ALDAY
6	4	3.6	10	3.1	13 1	399	37	94	290	132	124	56	ALSOP
7	5	4.5	12	3.7	15 9	480	45	114	380	172	110	50	ALTRY
8	6	5.4	12	3.7	15 10	483	46	117	390	176	130	59	ALOST
9	8	7.3	12	3.7	16-3	495	49	124	470	213	135	61	AKIND
10	10	9.1	12	3.7	16 9	511	54	137	570	259	140	64	AMEND
11	12	10.9	12	3.7	16-9	511	54	137	800	363	130†	59	ATEST
12	16	14.5	12	3.7	17-1	521	62	157	1000	454	135†	61	AYARD
13	20	18.1	12	3.7	18-5	561	70	178	1375	624	140†	64	AGOYD
14	32‡	29.0		.	..		..	.		...			...
15	40‡	36.3	..		.	...	..						

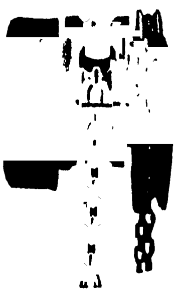
* Height which blocks with regular lengths of chain will hoist above level on which operator stands.
† For each hand chain
‡ Prices and full particulars sent upon application.

Construction—Gears The use of steel planetary spur gears, instead of cast iron, maintains the highest possible efficiency, and prolongs the life of the hoist.

Loop Hand Chain Guide (Patented)—An endless steel loop, with fixed guide strips adjacent to the flanges of the wheel, extending from one guide to the other and conforming to the circumference of the wheel.

The advantages of this construction over the strap guide, ordinarily used, are (1) it protects the hand wheel and working parts from damage, (2) it effectually prevents "gagging" of hand chain and injury to block, even when hoist is operated at high speed, (3) it permits rapid travel of hand chain without overriding the flange of the hand wheel and (4) it insures a safe and durable hoist.

The Loop Hand Chain Guide is furnished as standard equipment for Ford "Triblocs" in all sizes from ¼ to 20 tons.



LOOP GUIDE

Chains and Hooks—Are made from carefully selected steel stock having high tensile strength combined with great ductility.

Inspection—All parts are subjected to the most rigid inspection and test before being assembled.

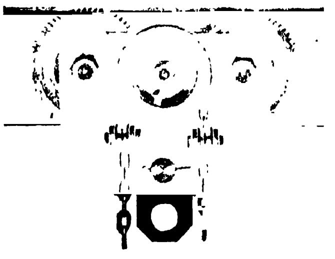
DIFFERENTIAL AND SCREW HOISTS

Differential hoists are desirable for occasional use where efficiency and speed are not essential. Capacity ¼ to 3 tons.

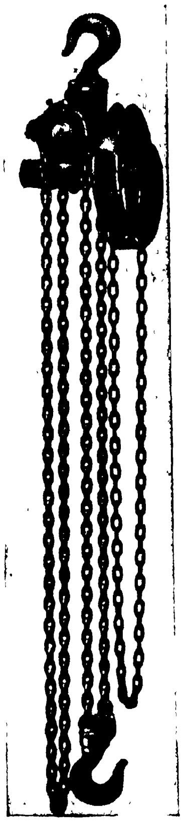
Screw hoists, although not as efficient as the Ford "Tribloc," are sometimes preferred for portable use, as they are much lighter and at the same time powerful and durable. Capacity ½ to 10 tons.

STEEL PLATE TROLLEYS

Both plain and geared types carried in stock for immediate shipment. Made to fit any I-beam.



ROLLER BEARING STEEL PLATE TROLLEYS GEARED TYPE



SCREW HOIST DUPLEX TYPE

FOAMITE FIREFOAM COMPANY

200 Fifth Avenue, NEW YORK, N. Y.

BRANCH OFFICES

ATLANTA, GA.
Foamite Firefoam Company, 125 Ivy Street
BOSTON, MASS
Foamite Firefoam Company, 813 Old South Bldg.
CHICAGO, ILL.
Firefoam Engineering Co., Dearborn and Lake Sts.
CLEVELAND, OHIO
Firefoam Co. of Ohio, 2133 East Ninth St.
DENVER, COLO.
Rocky Mountain Firefoam Co., 1109 Broadway
KANSAS CITY, MO.
Foamite Firefoam Company, 1012 Baltimore Avenue

PHILADELPHIA, PA.
Atlantic Firefoam Co , 1509 Arch St.
PITTSBURGH, PA.
Firefoam Sales Co., 105 Wood Street
ST. LOUIS, MO.
Foamite Firefoam Company, 1014 Pine St.
SAN FRANCISCO, CALIF
Pacific Foamite Firefoam Co., Mills Bldg.
HAMILTON, CANADA
Canadian Foamite Firefoam, Ltd.
LONDON, W., 1, ENGLAND
Foamite Firefoam, Ltd., 65 South Molton St.

PRODUCTS

Foamite Firefoam and Firefoam equipment, including:

Fire Pails
Hand Extinguishers
Portable and Stationary Engines
Motor Transport Engines
Automatic Sprinkler Systems
Protective Systems (Special Installations for Oil Refineries, Tank Farms, Marine and Chemical Risks)
Special installations designed for extra hazardous risks

OUR SERVICES

The firefoam method of extinguishing fire has reduced fire protection to an exact engineering calculation. When we know the nature of your fire risk and the number of square feet that require protection we can tell you what size and type of Firefoam equipment to install in your plant

Our engineering department is organized to design complete automatic Firefoam Sprinkler Systems and Special Protective Systems for every industry where there are big dangerous fire problems requiring engineering talent for their solution. The Firefoam method reduces the chances of a destructive fire to the minimum and *assists in lowering insurance rates*.

Our Inspection Department never forgets about the Firefoam equipment you have installed Not even a single Hand Extinguisher is overlooked Furthermore, a thorough system of tabulating futures is maintained for the purpose of keeping Firefoam users informed as to the condition of their properties in relation to fire risks.

Both our Engineering and Inspection Departments are composed of engineers expert in fire prevention and protection These engineers can solve your fire problems for all time, and adequately protect your property as well as the lives of your employees.

DESCRIPTION

As a rule there is no such thing as an incipient fire where inflammable liquids become ignited There is a flash, generally followed by an explosion,—then flames everywhere The heat is most intense

To provide real fire protection under such conditions, the capacity of the protective system must be commensurate with the risk involved. Firefoam is readily adaptable on the largest possible scale. Our Engineering Department designs systems specially suited to the conditions surrounding each particular risk.

Our policy is to allow a reasonable but ample factor of safety to cover every fire contingency. With the Firefoam System on guard, the chance of a disastrous loss, even in connection with the most hazardous risks, is reduced to a negligible item.

Firefoam is a fire-smothering, fire-extinguishing foam which covers all burning objects like a blanket. It puts out fire quicker than other extinguishing agents, and *prevents re-ignition*. It coats and clings to all surfaces, and floats on even the most inflammable liquids. It is effective against every kind of fire. Unlike water, it does not damage

Firefoam has an extremely large covering capacity. When discharged it expands under self-generated pressure eight times its original volume. A three-gallon Firefoam Fire Pail will produce 24 gallons of Firefoam.

APPLICATION IN CHEMICAL INDUSTRIES

The Firefoam System supplies complete protection to oil tanks and refineries and chemical plants, but is peculiarly adapted for installation in factories where inflammable substances are used in the process of manufacture As many inflammable liquids are not miscible with water, the ordinary form of carbonic-acid gas extinguisher is more likely to spread the fire than to extinguish it. Firefoam floats on the surface of burning liquid, and there are no noxious fumes Firefoam contains no substances which will injure the surface to which it is applied It will not render a burning liquid unfit for immediate use

INDUSTRIES USING INFLAMMABLE LIQUIDS

The following industries use one or more highly inflammable liquid in the ordinary process of manufacture:

Acetaldehyde
Alkaloids
Artificial Silk
Artificial leather
Betanaphthol
Barometer and Thermometer tubes
Benzoic acid
Brushes
Celluloid
Chloroform
Cigars and cigarettes
Coal tar
Collodion
Confectioner's colors
Coumarin
Cutlery
Dental alloys
Deodorants
Disinfectants
Drugs
Dyes
Embalming fluids
Ether
Ethyl anilines
Ethyl chloride
Ethyl esters
Explosives
Filaments for lamps
Formaldehyde
Fulminating caps
Furniture
Gelatine capsules
Glycerophosphates
Guaiacol
Hats
Inks
Jewelry and watches
Lacquers
Leather
Liniments
Mirrors
Moldings and frames
Paint
Perfumes
Phenacetin
Phenolphthalein
Photographic films
Photographic chemicals
Photoengraving
Pyroxylin plastics
Pyralin articles
Resorcin
Rubber and rubber goods
Soaps
Shellacs
Salol
Smokeless powder
Shampoo paste and liquid
Shoe polish
Surgical goods
Trinitrotoluol
Varnishes
Water colors and Wood finishes

Continued on Next Page

FIREFOAM SYSTEMS

Firefoam Systems generally consist of large solution tanks and a central pumping station from which the Firefoam solutions are pumped through pipes to the most remote parts of a plant or building These systems can be arranged for either automatic or manual operation or both as may be desired They provide absolute protection against a destructive fire

There are many rooms in chemical plants where the fire risk is as great as in oil refineries The Firefoam System is now available to protect these hazardous fire risks just as it has protected even greater risks in the oil field.

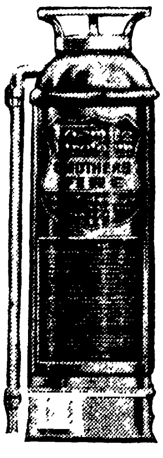
THREE-GALLON FIREFOAM PAIL

A most remarkable fire-fighting device—twenty-four gallons of Firefoam are spread on the fire by one of these pails Compare three gallons of water with twenty-four gallons of Firefoam and you will appreciate why these pails are worth ten ordinary ones For quick work on floor fires or fires in small kettles of inflammables, these pails are invaluable. No skill required to operate

3-GAL. FIREFOAM PAIL

HAND EXTINGUISHER

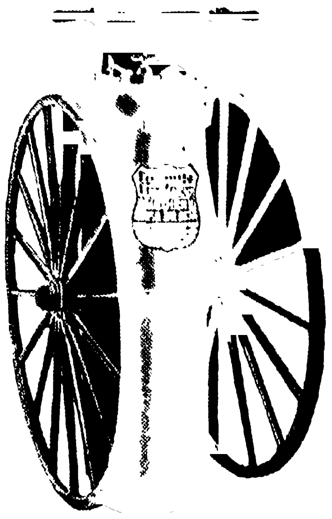
Approved two and one-half gallon size—Discharges 20 gallons of Firefoam under high pressure Smothers quickly ordinary fires, oil and gasoline fires, enamel, varnish and chemical fires. Completely fire-proofs No reflash—no rekindling The fire is out to stay out



2½-GAL. FIREFOAM
HAND EXTINGUISHER

FIREFOAM FORTY-GALLON ENGINE

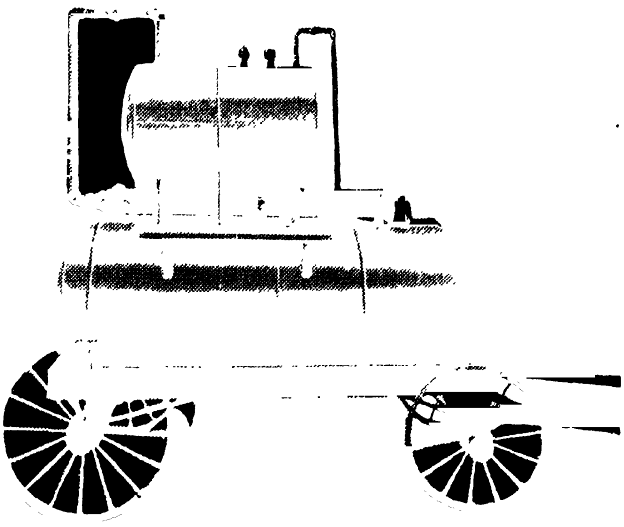
Capacity—Eight times its contents. This engine highly recommended for protecting dangerous fire risks in plants, buildings, and other places where hand extinguishers would prove of insufficient capacity. Its operation is simple One man can handle it easily.



FIREFOAM 40-GAL. ENGINE

FIREFOAM 250-GALLON ENGINE

Also made in larger sizes—This engine, with its great capacity, is designed especially for use in places in which are tanks of inflammable chemicals It operates under self-generated pressure and is easily handled.



FIREFOAM 250-GAL. ENGINE

FOSTER PUMP WORKS

Established 1860

Manufacturers of Pumping Machinery

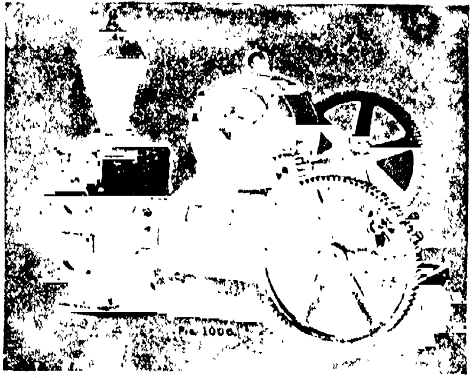
36 BRIDGE STREET, BROOKLYN, N. Y.

PRODUCTS

Pumps: Steam, Power, Boiler Feed, Pressure, Tank or Light Service, Brine, Ball Valve, Ammonia, Tannery, Food Products, Filter Press, Oil and Gasoline, Vacuum, Low and High Pressure, Air and Racking, Simplex and Duplex, Open Well, Artesian Well. Rotary Pumps—Steam, Electric, Gas, Oil Engine, Belt, or Hand Driven. Special Pumping Machinery.

"FOSTER" MOTOR DRIVEN, SIMPLEX OR DUPLEX, PRESSURE AND LIGHT SERVICE POWER PUMPS

Construction—Cylinders, Caps, Air Chamber, and Power Frame of best quality gray cast iron, designed to withstand heavy stresses. Extra heavy Hard Bronze Linings in Cylinders, Piston Rods of Tobin Bronze. Piston is of Bronze. Stuffing Boxes of Cast Bronze. Valve Seats, Stems and Springs of hard Bronze. Crosshead is of Engine Type, Box Construction, fitted with Bronze Shoes, arranged for adjustment of wear. Crosshead Pin works in Bronze Renewable Bearings. The Crankshaft and Connecting Rods are of high Tension Alloy Steel. These Pumps are also arranged for Belt Drive, in which case a Tight or Loose Pulley is mounted on the Countershaft.



MOTOR DRIVEN POWER PUMP

All Gearing is accurately cut. Their accuracy gives efficiency and a high degree of silence in operation.

They will give the greatest amount of pumping service for the investment, which their cost and installation represent. The quality of material, the workmanship and the excellence of design reduce maintenance and repairs to a minimum. Sixty years of pump building knowledge is at your disposal. Bulletin No. 1019 describes our power pumps.

FOR BOILER FEED, FILTER PRESS, OR PRESSURE WORK

Diam of Cylinder	Stroke	R P M.	Gal per Single Stroke	Gallons per min.	Approx H P. Required for 150 lb pressure
Partial List of Sizes, Duplex Type—Motor and Belt Driven					
3	5	120	.153	74	7½
4	9	67	489	130	15
6	12	50	1 468	290	30

FOR GENERAL AND LIGHT SERVICE WORK

Partial List of Sizes, Duplex Type—Motor and Belt Driven

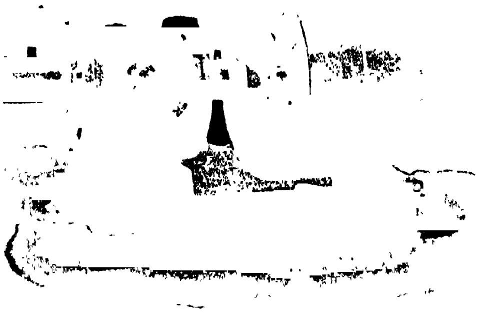
3	5	120	153	74	8
6	9	67	1 101	292	10
12	12	50	5 875	1168	35

FOSTER "EXCELSIOR" POWER ROTARY PUMPS, BLOWERS AND VACUUM PUMPS

The Foster Rotary Pumps are ideal for the moving of large volumes of liquid against moderate heads. They are noted for their positive suction and discharge, no foot or check valves are required in the suction line. They successfully meet pumping conditions for which the reciprocating and the centrifugal types of pumps are unsuited, due to the inherent defects of these types.

Rotary Pumps are used successfully in Chemical, Paint, Varnish and Food Product Processes, Color Works and Oil Refineries. Only the best of material is used and the highest grade of workmanship only is tolerated. The name "Foster" is inseparably associated with Rotary Pump excellence.

Types—These Pumps can be supplied in Hand, Belt, Motor or Engine Driven types with flanged or threaded outlets and inlets, made in Iron, Bronze, or special metals to suit service requirements.



BELT DRIVEN ROTARY PUMP

TABLE OF SIZES AND CAPACITIES

Type R1, suitable for fifty (50) pounds per square inch maximum pressure. Type R2, suitable for one hundred (100) pounds per square inch maximum pressure

Pump No Type R1	R.P M	Capacity G P M	Pipe Sizes		Pulleys		Approx H'power Required Type R1	Approx H'power Required Type R2
			Suction	Discharge	Diam.	Belt		
R1 0	260	15	¾"	¾"	9"	1½"	1	1½
R1 1	200	25	1"	1"	10"	2"	1½	2½
R1 2	200	33	1¼"	1¼"	12"	3"	2	3
R1 3	200	45	1½"	1½"	12"	3"	2½	5
R1-4	175	90	2"	2"	14"	4"	3½	5½
R1-5	130	175	3or4"	3or4"	18"	6"	6½	10

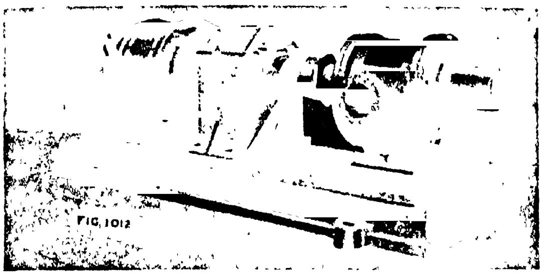
Use—They are being used with entire satisfaction in the Paint and Varnish Industries for pumping Paints, Shellacs, Lacquers, Enamels, Colors in Oil, Colors in Varnish, White Lead in Oil, White Lead in Paste, Naphtha, Kerosene, Turpentine, Tung Oil and Medium Pitches, also in the Oil Works and Refineries for pumping Crude Oil, Gasoline, Heavy Oil Residues, Lubricating Oil and Greases, for Food Product Manufacturers for pumping Milk, Fruit Syrups, Grain Mash, Molasses and other Sugar Syrups, Beverages, Beer, Beer Mash. In the Chemical Industries for Filter Press Work, both of the pressure and suction types, Acidulous Liquids, Alkaline Liquids, Soap, Starch mixtures, Gelatines, Glues, Paper Pulp, Ink, Water, Salt Water, Ammonia, Heavy Brine.

Bulletin No. 1001 fully explaining this unit sent on request.

Continued on Next Page

FOSTER "EXCELSIOR" MOTOR DRIVEN ROTARY PUMPS, BLOWERS AND VACUUM PUMPS

These machines are equipped with Type R1 Rotary Pumps, suitable for fifty (50) pounds per square inch maximum pressure, and also with Type R2 Rotary Pumps, suitable for one hundred (100) pounds maximum pressure. In addition to the Rotary Pumps, these Motor Driven Pumping Outfits consist of a sturdy and efficient Gear Reduction Unit and Electric Motor, all mounted on substantial Iron Base. The advantages of this type equipment are many, among them being the low cost of installation and small floor space required. They are regularly furnished for floor mounting, but can also be furnished for mounting on ceiling or side wall, but will not be furnished for such mounting unless so specified in ordering.



MOTOR DRIVEN ROTARY PUMP

The Gear Case—Consists of a Cast Iron Box and cover. The Reduction Gears consist of two (2) sets of Spur Gears. The Case is oil tight and Gears constantly running in Oil. The oil contained in the Gear Case also serves to lubricate all Bearings.

The Gears are accurately cut by the generator method on Fellows Gear Shaper, insuring maximum efficiency and silence in operation. The cover of the Gear Case is readily removable for inspection.

Sizes and Capacities—It is necessary for us to know fairly definitely for what service the pump is intended. Upon receipt of this information we can make recommendations and furnish quotations. The sizes and capacities for all Pumps for pressures up to 50 and 100 pounds per square inch are given in the table shown under **Belt Driven Rotary Pumps.**

Bulletin No. 1002 fully explaining this unit sent on request.

MOTOR DRIVEN PUMP QUOTATIONS

Requests for quotations on all classes of motor driven equipment should include information covering voltage, whether A. C. or D. C. If A. C. phase and cycles

HAND AND BARREL FILLING TYPES

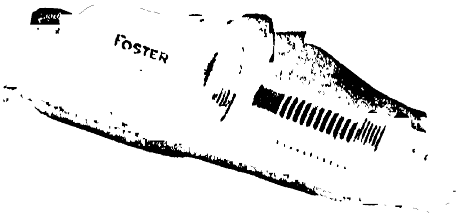
Rotary Pumps are also furnished provided with hand wheel drive for barrel filling and emptying and similar uses.

They can be obtained with either top or side outlet to suit piping layout. The Pump and Piping are furnished in Iron, but can be provided in bronze or monel metal for use in pumping water, chemicals, acids, etc.

STRAINERS

All materials passing through pipe lines contain considerable foreign matter, which is highly injurious to manufacturing processes and machinery in use with such processes.

The use of a proper strainer will pay for its cost in a remarkably short space of time by reducing the repair bills of machinery to a minimum. It will also increase production.



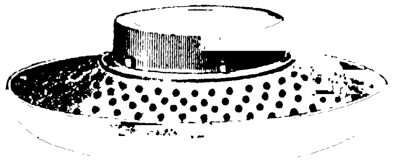
TYPE W GENERAL SERVICE STRAINER

Type W Strainer—Type W Strainer will meet every ordinary need for a pipe line strainer. It can be quickly and easily cleaned of all trapped foreign matter, by the removal of the strainer element. No breaking of pipe connections necessary.

The direction of the flow through the strainer is the most direct possible.

TYPE F STRAINER

Type F Strainer—Type F Strainer has been developed to meet the need of a strainer that can be thoroughly and quickly cleaned after using. It is entirely removable from the pipe lines for sterilization.



TYPE B TANK AND PIT STRAINER

Type B Strainer—Type B Strainer is used on the end of suction lines, where desirable that contents of tank be removed without stirring up of the sediment in tank. Readily cleaned without removal by brushing off top of strainer element.

Special Strainers—Standard opening in Type W and Type F strainers are 1/16, ⅛ and 3/16. Special strainers can be furnished having woven wire cloth of any size or metal. Such strainers are suitable for the fine screening of liquids before entering filter presses, and their use in this way increases the production of the press.

THE FOXBORO CO., INC.

FOXBORO, MASS., U. S. A.

BRANCH OFFICES

New York
50 Church Street
Birmingham
Brown Marx Bldg

Chicago
Monadnock Bldg

Philadelphia
809 Stock Exchange Bldg
Tulsa, Okla
213 S. Cincinnati Ave

Pittsburgh
901 Park Bldg
San Francisco
461 Market Street

Montreal, Canada
Peacock Bros

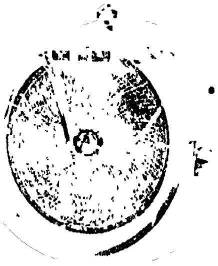
PRODUCTS

- **Gauges**
  - Airplane
  - Indicating
  - Liquid level
  - Mercury
  - Pressure
  - Recording
  - Syphon
  - Vacuum
- **Gauge Boards**
- **Pyrometers**
  - Electric
  - Indicating
  - Recording
- **Counters, round**
- **Recorders**
  - CO_2 for flue gas analysis
  - Differential pressure
  - Electrical time
  - Mechanical time
- **Thermometers**
  - Airplane
  - Indicating
  - Recording
- **Clocks**
- **Controllers, automatic temperature**
- **Indicators, air-speed**
- **Meters, flow for gas and liquids**
- **Planimeters, radial**
- **Psychrometers, recording**

GAUGES

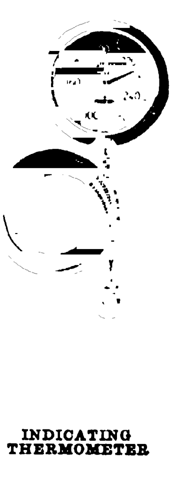
INDICATING GAUGE

Indicating — Movements entirely independent of case and absolutely non-corrosive. Perfectly aligned and permanently accurate. Sizes from two to twenty-four inches. Any range from full vacuum to 20,000 pounds. Bulletin AZ-95-2 gives complete information.

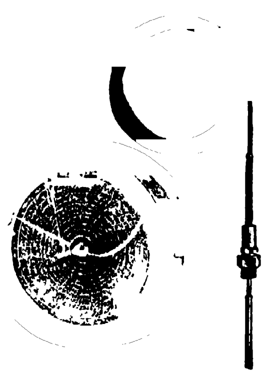

RECORDING GAUGE

Recording—For steam, gas, water, air, oil, ammonia, brine, or anything under vacuum or pressure. The improved supported helical and diaphragm tube movements and pen arms eliminate the effect of vibrations. All Foxboro recorders can be furnished with the inverted pen which eliminates the troubles caused by ink running down the pen arm. Bulletin AZ-98-1 gives complete information.

THERMOMETERS

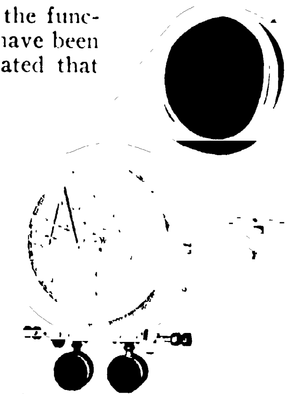

INDICATING THERMOMETER

Indicating—Long distance or stem types. Greatly superior to the glass bulb mercurial thermometer, one advantage being that excessive breakage is done away with. Bulbs are made of metal, and no mercury is used. The clear open scale permits of easy and accurate readings.


RECORDING THERMOMETER

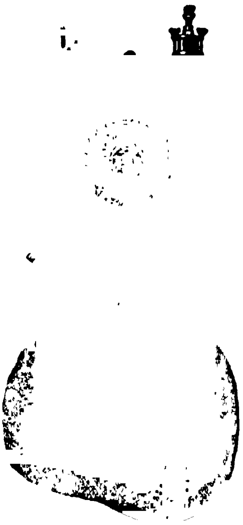
Recording — Used everywhere to provide an efficient check on important chemical operations. Permanency guaranteed. No multiplying devices used. Special lead and acid resisting bulbs made for chemical industry. Three sizes: eight, ten and twelve inches. Inverted pen. Latest improvements. Bulletin AZ-104-1, Indicating and Recording Thermometers, gives complete information.

AUTOMATIC TEMPERATURE RECORDER-CONTROLLER


TEMPERATURE RECORDER-CONTROLLER

A new design in which the functions of two instruments have been combined and so coordinated that perfect synchronization is obtained. The use of only one bulb to actuate both the recorder and the controller elements gives an accurate record of the controller operation. Valves designed to operate on either pressure or vacuum. An improved form of rubber diaphragm motor is employed, which is so designed that, even under severe conditions, no undue stresses are set up in the diaphragm itself. Bulletin AZ-127 is all about this new instrument.

FOXBORO-HEATH CO_2 RECORDER


CO_2 RECORDER

In reality an automatic recording Orsat. A solution of caustic used for a reagent. Motive power obtained from constant flow of water and periodic operation of automatic syphon. Only three moving parts—clock movement for rotating chart, pen actuating float, and dotting mechanism. No glass to break, no rubber tubes to deteriorate; non-corrosive metal on working parts. Simple in construction, in operation and in maintenance. No mechanical adjustments to be made, and nothing to get out of order. Registers only the carbon dioxide content in flue gases. Bulletin AZ-114 gives full information.

DISTILLATION INDUSTRIES, INC.

Whitaker-Pritchard Distillation Process

52 VANDERBILT AVENUE, NEW YORK, N. Y.

PRODUCT

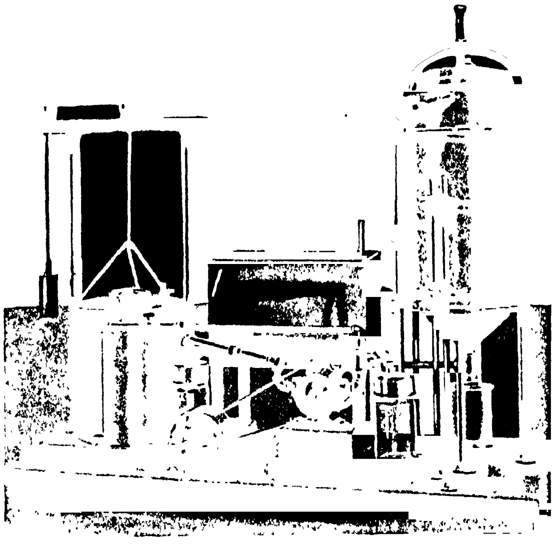
Whitaker-Pritchard Destructive Distillation Process.

ADAPTABILITY

The process can be utilized for the destructive distillation of

- Cannel Coal
- Bituminous Coal
- Lignite
- Peat
- Oil Shale
- Wood (Resinous)
- Wood (Hard)
- Bone
- Ivory (Vegetable)
- Ivory (Natural)
- Wood Waste (Sulphite)
- Rice Hulls
- Grain Alcohol Waste
- Oil Sands
- Tar Paper Waste
- Rubber Scrap
- Patent Roofing Waste
- Asphalt
- Garbage
- Dried Blood
- Linseed Meal Cake
- Cocoanut Shells

Various Industrial Wastes



RESEARCH MODEL

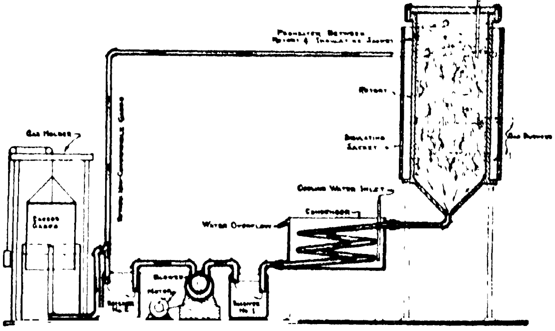
APPLICATION OF LABORATORY MODEL

There are many instances in laboratories, both Research and Industrial, where destructive distillations are continually being carried out with makeshift apparatus that give inaccurate results, regardless of the most earnest efforts at accuracy.

The laboratory model of the Whitaker-Pritchard process of destructive distillation, has been built to replace makeshift apparatus with a model that is an exact duplicate of the industrial design. By means of this model equipment every detail of operation and chemical control can be had in any process of destructive distillation.

PROCESS USED ON INDUSTRIAL SCALE

The equipment required for destructive distillation on a manufacturing scale is the same in principle as the Research model.



CROSS-SECTION OF MODEL DEMONSTRATING PRINCIPLE OF PROCESS

Standard Retort designs of either vertical or horizontal type are in use and are equally applicable to the process. From the condenser the vapors, or such as are not condensable, are carried to a blower or fan, and from there are forced through a superheater and returned to the retort. Passing through the distilling mass by means of their positive carrying power and sweeping effect they not only distribute the heat through the mass but act as a scavenger and carry out the vapors formed as rapidly as is desired.

The velocity of the gases through the retort provides a definite temperature control.

One of the striking features of this process is the fact that experimental results obtained with the laboratory model are duplicated when operated on a commercial scale.

ADVANTAGES

(1) There is a definite temperature control during the entire operation. (2) The time of distillation is reduced at least one-third (3) The quantity of distillates is increased, and in some cases this increase has been enough to pay for the entire operation. (4) The quality of the distillates is improved, are more uniform, and of a definite standard (5) The distillates are more easily refined and the refining losses reduced.

INSTALLATIONS

The Bone Char Products Co., Allentown, Pa., are using our process, under license, for destructive distillation of bone. The Acme Coal Products Co., New York, are licensees, under our patents, for the commercial application of this process to the destructive distillation of coal for the production of gas, coke and its by-products.

FULLER-LEHIGH COMPANY

Manufacturers of Complete Powdered Coal Equipment. Pulverizing Machinery for All Refractory Materials. Chilled and Chemical Castings

MAIN OFFICE AND WORKS

FULLERTON, PA., U. S. A.

BRANCH OFFICES

New York, N. Y., 50 Church Street
Seattle, Wash., 1915 L. C. Smith Building
London, England, 25 Victoria Street, Westminster, S. W. 1

Chicago, Ill., 1336 McCormick Building
Montreal, Canada, Canada Life Building
Hamburg 1, Germany, "Wallhof", Glockengiesserwall 2

PRODUCTS

Pulverized Coal Equipment, including Pulverizer Mills, Dryers, Roll Crushers, and Pulverized Coal Feeders.

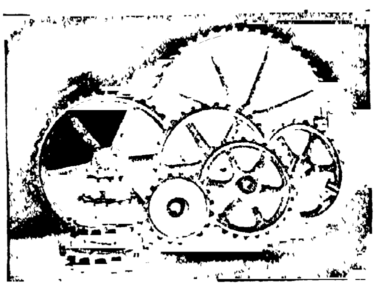
Gyratory Crushers, and Cone Heads and Concaves.
Jaw Crusher Plates.
Disintegrating Rolls.
Roll Shells for Roll Crushers.
Roll Heads and Rings for Roller Mills.
Ball Mills and Ball Mill Linings.
Tube Mills and Tube Mill Linings.
Muller Rings for Dry Pans.
Track Plates and Perforated Screens for Dry Pans.
Mixer Blades or Paddles.
Lining Plates for Chutes.
Conveyor Gudgeons and Bearings.
Sprocket and Traction Wheels.
Wire Rope Rollers and Sheaves.
Car Wheels and Axles.
Chilled Castings.
Repair Parts.
Conveyor Systems for Pulverized Material.

Chemical and Acid Heat Resisting Castings for all purposes; also special castings of all descriptions made according to specifications, up to 35 tons in weight; Nitric Acid Retorts, Caustic Soda Pots, Sulphuric Acid Concentrating Pans, Muriatic Decomposing Pots, Acid Eggs, Manheim Furnace Castings, Niter Pots, Desilverizing Kettles, Matte Pans, Lead Refining Kettles, Anode Molds, Slag Tapping Blocks, Cylinders, Vacuum Pans, Condensers, Pump Castings, Generator and Motor Castings, Cinder Ladles, etc.

FACE HARDENED SPROCKET WHEELS

In developing our sprocket wheels we aim to produce a product giving longest life, and maintaining pitch diameter.

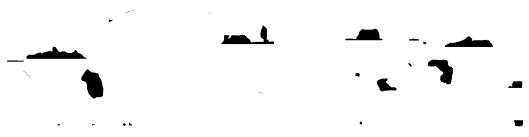
The teeth and rims of our wheels are specially hardened and treated, resulting in a smooth surface and engage the links without cutting. The wheels are perfectly fitted for the chains, insuring smooth operation and maximum efficiency for both wheel and chain.



GROUP OF FACE HARDENED SPROCKET WHEELS

PUMP FOR CONVEYING PULVERIZED MATERIALS

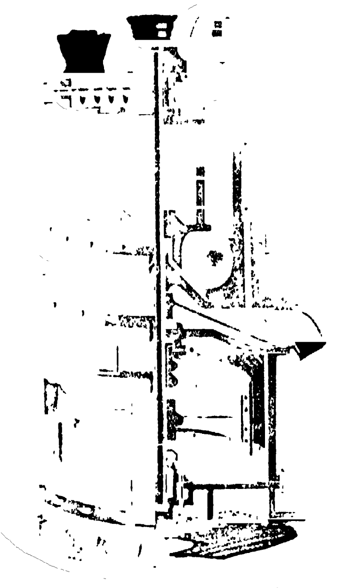
Pump for conveying pulverized material using standard size pipe as a conveyor line which may be run up or down grade making any number of bends. Simple and economical to install and operate. Its flexibility makes it adaptable to any existing or contemplated plant layout, while absolute dustlessness insures safety and comfort for workmen.



FULLER-KINYON PUMP FOR CONVEYING PULVERIZED MATERIALS

FULLER MILL

Fuller Mill, a complete, self-contained, single reduction unit producing uniformly and finely pulverized material in one operation. Its rugged construction, low installation and operation costs make it especially desirable for pulverizing all kinds of refractory materials.

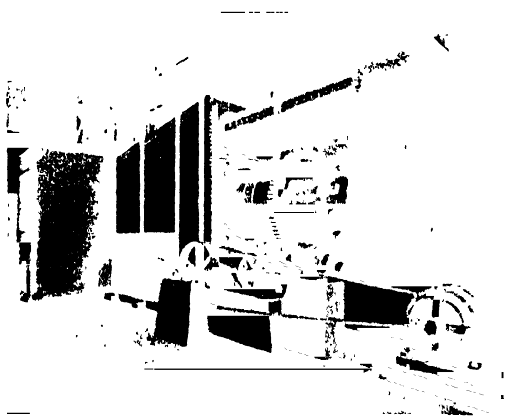


PULLEY DRIVEN FULLER MILL

Continued on Next Page

INDIRECT FIRED ROTARY DRYER

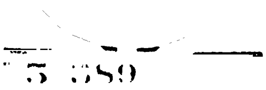
Indirect Fired Rotary Dryers are designed and built by experts who through years of research have determined the most efficient types to produce a maximum drying capacity with the minimum amount of fuel used.



FULLER-LEHIGH INDIRECT FIRED ROTARY DRYER

CAUSTIC POTS

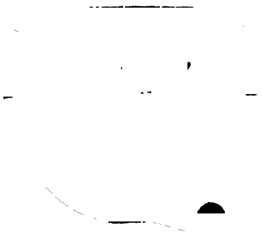
The majority of the caustic soda manufacturers of the country use "Fuller-Lehigh" caustic pots. Comparative tests with those of other manufacturers invariably leads to the adoption of the "Fuller-Lehigh." These kettles can be made of any size or preferred shape. Testimonials furnished on request.



CAUSTIC POT

NITRIC ACID RETORTS

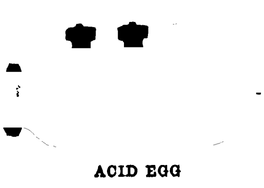
The mixture used for these vessels is the result of experiments conducted jointly with one of the largest chemical companies of the world. No retorts are removed from mold until cold. They can be furnished either of the vertical or horizontal type.



NITRIC ACID RETORT

ACID EGGS

Made of special iron which experience has proven unexcelled for durability in this service. Tested in our shop to 300 lbs. pressure.



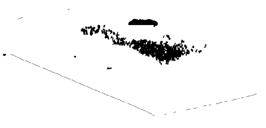
ACID EGG

MANHEIM FURNACE CASTINGS

MANHEIM FURNACE CASTING

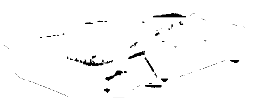
Special foundry process, demonstrated mixtures, and ability to cast and machine extremely large sizes, result in benefits which the chemical trade is constantly finding to its advantage. Our records have not been approached by any manufacturer.

SULPHURIC ACID CONCENTRATING PANS



SULPHURIC ACID CONCENTRATING PAN

A yield of 400% and more beyond the general average obtained from other makes is the usual result of comparative tests in actual operation. Metal used in castings for this service is double the strength of best grades of cast iron, tendency toward cracking is therefore eliminated to a minimum. In density it is like chilled iron. They are practically "fool-proof." A large assortment of pattern equipment insures prompt execution of orders. The few renewals required where "Fuller-Lehigh" pans are used insure large operating economy.



SULPHURIC ACID PAN WITH LOOSE BAFFLE
Pat. applied for

The largest oil companies in the world use "Fuller-Lehigh" products for this service.

Being the first company to make such pans, we are able to give users the benefit of long experience as regards both designs and mixtures. Repeat orders and long-term contracts from large users are testimony to wonderful results constantly being attained.

STATOR FRAME

SPECIAL CASTINGS

Kettles and castings of any description, size or shape, are made according to customers' specifications, usually from skeleton patterns or sweeps. Estimates promptly and cheerfully furnished.

LOCATION

Situated in the heart of the iron-producing section of the Lehigh Valley and in close proximity to coal mines and sand pits, gives this company a commanding position in the making of its products.

MACHINE SHOP FACILITIES

These include boring mills that will machine castings up to 17′5″ diameter x 10′ high, planer 6′ x 22′, radial drills, vertical and horizontal facing machines, large lathes, etc.

THE FULTON COMPANY

Manufacturers of

Sylphon Automatic Temperature Controlling Instruments

KNOXVILLE, TENNESSEE

NEW YORK, N Y
Hudson Terminal Building
50 Church St

DETROIT
1247 Washington Blvd

CHICAGO, ILL
Wrigley Building
400 North Michigan Avenue

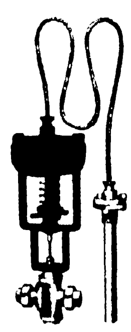
REPRESENTATIVES IN ALL PRINCIPAL CENTERS
The Largest Plant in the World Devoted to the Manufacture of Thermostatic Instruments

PRODUCTS

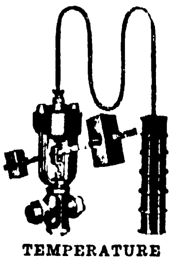
Patentees and manufacturers of Sylphon Products. Sylphon Packless Radiator Valves; Sylphon Hazardous Liquid Packless Valves; Sylphon Standard Pressure Packless Valves; Sylphon Temperature and Pressure Regulators; Sylphon Air Line Valves and other Sylphon Heating Specialties.

TEMPERATURE REGULATORS

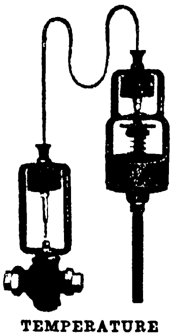
For nearly all requirements where liquids are heated by steam, and especially industrial uses, regulators are regularly furnished at a temperature range of 140 degrees to 180 degrees Fahr. Special regulators can be furnished with adjustment for 20 degrees above or below the operating point for temperatures not lower than 50° F. nor higher than 250° F. The No. 930 Regulator is the same as the No. 931, except that it has the lever and weight method of adjustment instead of the spring type shown here. The extreme sensitiveness, positive action and simplicity of these regulators have placed them in a class by themselves, and made them applicable in hundreds of ways. No. 931 Regulators are furnished regularly in sizes from ½" to 2½" inclusive, and the No. 930 Regulator in sizes from ½" to 5" inclusive.


TEMPERATURE REGULATOR NO. 931

No. 980 and No. 981—To automatically control temperature of air in dry rooms, etc., and can be furnished with the same temperature ranges as shown on our No. 930 and No. 931 Sylphon Temperature Regulators. The thermostatic bulb, of our own special design, is so constructed that it may be placed at any point in the room in which the air is to be controlled, and is connected with the operating valve by a flexible tube of any required length. It is furnished in either the lever and weight type, similar to the No. 930, or the spring adjustment type, similar to the No. 931. The latter is designated as our No. 981.

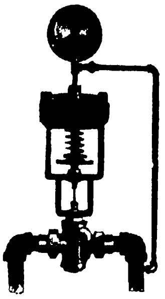

TEMPERATURE REGULATOR NO. 980

No. 932—This regulator, known as our detachable tube type, is composed of three distinct and separable units. These units are made so that each may be separately replaced or removed for repairs, as the case may be. If the flexible tubing should become damaged or broken, the power transmitting unit may readily be replaced by loosening two lock nuts, and the repair part slipped into place. The operation is similar to the No. 930 and No. 931 instruments. Ask for Bulletin CT-102.


TEMPERATURE REGULATOR NO. 932

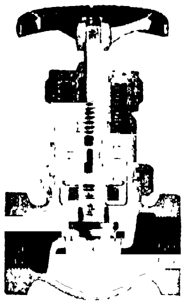
PRESSURE REGULATOR

This regulator will reduce and regulate pressure from any initial pressure to any pressure under 40 pounds and maintain it steadily without any fluctuation. Its extreme sensitiveness makes it possible to reduce the pressure to as low as 2 pounds. The instrument has the spring method of adjustment as used in our No. 931 Sylphon Temperature Regulator. With this regulator it is possible to take the controlling pressure from any desired point. Ask for Bulletin CT-102.


PRESSURE REGULATOR NO. 952

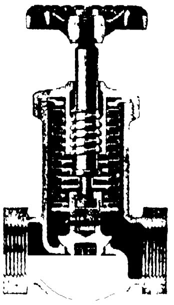
STANDARD PRESSURE PACKLESS VALVE

This valve embodies all essentials of high grade construction, eliminating the greatest fault of all other valves, **Leakage and Frequent Repacking.** The disc and seat are of special alloy, both renewable, and can be ground without removing the body from the line. Now, note the construction—the phosphor-bronze Sylphon, surrounding the stem and turning parts, forming an ever tight barrier to leakage of steam around the stem, **no packing,** hence no need for **repacking.** The only real advance in valve construction for many years, and is the result of satisfactory service rendered for more than a decade by the Sylphon Packless Radiator Valves for low pressure heating work. Ask for Bulletin CPV-3.


STANDARD PRESSURE VALVE NO. 304

HAZARDOUS LIQUID VALVES

These are designed for use, as the name suggests, in connection with the handling of gasolene, naphtha, etc., under pressures up to 50 pounds. The usual valve stem packing is eliminated by the use of the Sylphon bellows surrounding all moving parts. Approved and recommended by the Underwriter's Laboratories (No. M. H. 788). Ask for Bulletin CPV-2.

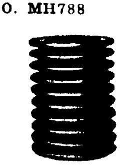

HAZARDOUS LIQUID VALVE NO. MH788

SPECIAL NOTE

Send for our "Specifications of Value" which give complete engineering data of the above products.

ADVANTAGES

All Sylphon devices embody the seamless, one-piece bellows of drawn metal shown above. There is not a bit of solder throughout its length—no chance for leaks or breaks. It is a feature found exclusively in Sylphon Products.


METAL HEART OF EVERY SYLPHON PRODUCT

J. M LUMMIS, Sales Mgr. ESTABLISHED 1874 L. A. LUMMIS, Asst. Sales Mgr.

GAYNER GLASS WORKS

Manufacturers Battery Jars, Demijohns, Carboys

Telephone
CORTLANDT 4146-3041

Sales Office, 149 Broadway, NEW YORK, N. Y.

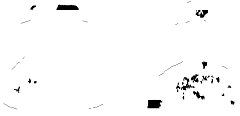
WORKS
SALEM, NEW JERSEY

PRODUCTS

Battery Jars, Acid Bottles, Carboys, Demijohns, Seltzer or Packing Bottles, Water Bottles, Large Storage Containers, and Other Large Glass Specialties.

ACID BOTTLES

Either narrow mouth or wide mouth with ground glass stoppers, in half gallons and larger.

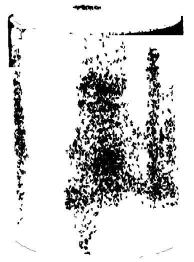


WIDE MOUTH GLASS STOPPERED ACID BOTTLE

BATTERY JARS

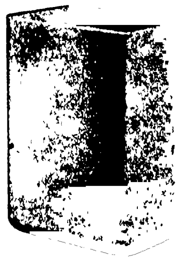
We have made a specialty of these for years. We are the largest manufacturers of this class of ware in the country and can furnish most any size or style desired. We carry large stocks of standard sizes. Special sizes or designs developed and furnished promptly.

NARROW MOUTH GLASS STOPPERED ACID BOTTLE



STYLE B

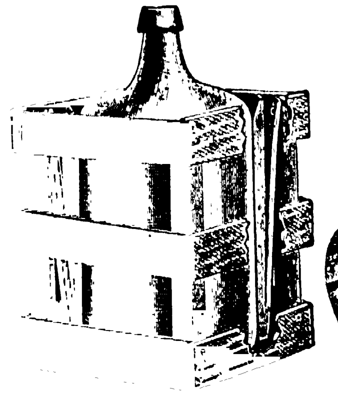
STYLE C RIDGES IN BOTTOM



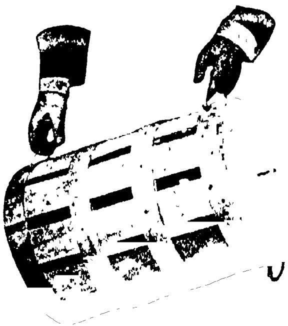
STYLE C PLAIN BOTTOM

WATER BOTTLES

These range in various sizes, shapes and styles of finish from ½ gallon to 5 gallons. Can be made from private moulds or lettered from our stock plate moulds. Can also supply the special spring water crates. We pay particular attention to the tempering of this ware and our water bottles are found to stand the severe service given them with entire satisfaction. We carry large stocks and can make shipments promptly



SPRING CORNERED CRATE



SPECIAL ROUND CRATE, TYPE A

PACKING

All goods are packed in well made crates and in a manner to insure delivery with minimum breakage. Special packing for export shipments on any of our products.

CARBOYS

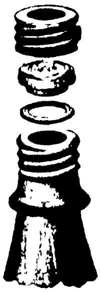
All sizes with any style finish desired. Boxed to suit the trade requirements or shipped in bulk. Well made, properly tempered, carefully tested and complying with the I. C. C. Specifications.

BOXED CARBOY

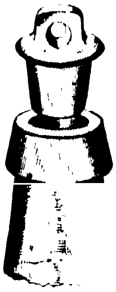
STRAIGHT SIDE IRON MOULD CARBOY

FINISHES ON CARBOYS

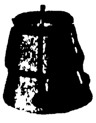
When desired we can furnish special style finish on carboys as shown below:



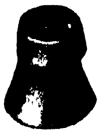
SCREW NECK METAL BAND GLASS LID AND GASKET



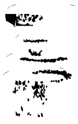
GROUND GLASS STOPPER



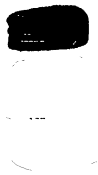
LIGHTNING FINISH



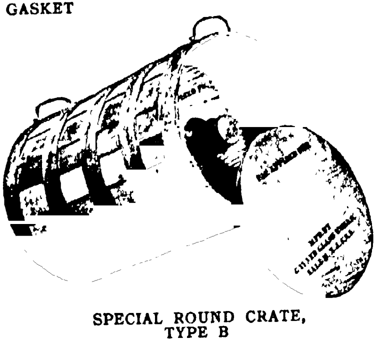
GODWIN GLASS STOPPER
Stopper rests in recess in neck and is closed with our special sealing compound



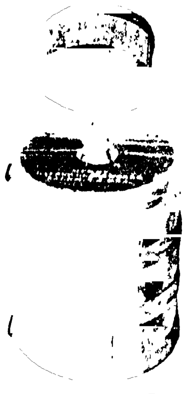
INSIDE SCREW GLASS STOPPER FINISH



SCREW NECK FINISH WITH METAL CAP



SPECIAL ROUND CRATE, TYPE B



SPECIAL ROUND CRATE, TYPE C WITH HOOD

SPECIAL ROUND CRATE

This is our new patented crate, extremely strong but very light. Different designs suitable for any purpose. Especially adapted to the use of the pharmaceutical trade. Ideal container for domestic and export shipments.

WILLIAM GARRIGUE & COMPANY

Designers and Manufacturers of Chemical Machinery
Specialists in Oils, Fats, Soap and Glycerine
154 NASSAU STREET, NEW YORK
WESTERN OFFICE AND PLANT: 45th Street and Western Blvd., Chicago

PRODUCTS

Complete Plants for:

- **Oil Extraction and Degreasing**
- **Fatty Acids Distillation**
- **Crude, Dynamite and Chemically Pure Glycerine**
- **Evaporation in Single or Multiple Effects**
- **Edible Oil Refining, Deodorizing and Bleaching: Oil Hardening and Vegetable Margarine Manufacture**
- **Fat Splitting, Stearic Acid and Red Oil**
- **Garbage Reduction and Rendering**
- **Causticizing Soda Ash**
- **Laundry and Toilet Soap and Soap Specialties**

Special Apparatus:

- **Dryers, Stationary and Rotary; Extractors; Stills; Kettles; Digesters; Autoclaves; Tanks; Condensers; Coils; etc.**

Engineering Service:

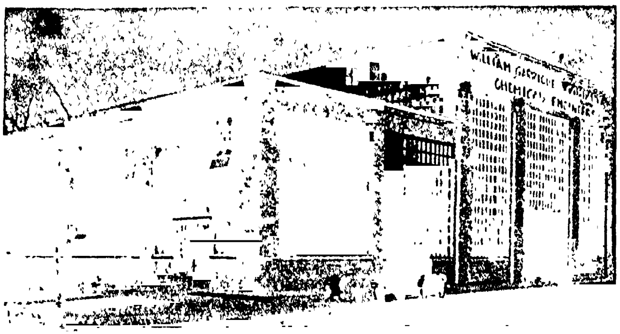
- **Complete Estimates on Equipment, Design and Arrangement of Plants and Installation and Operation of Apparatus.**

ENGINEERING ORGANIZATION

William Garrigue & Company maintain a staff of chemical and mechanical engineers who—in addition to being graduate engineers—have also had many years of practical experience in the lines in which we specialize.

These men are available for solving the problems of our customers, and for supervising the erection and operation of the installations which we undertake.

We do not confine our efforts to the sale of our own apparatus and it frequently happens that we can make simple alterations in an existing plant to increase capacity, reduce losses, save fuel, or in some other way improve the process.



WILLIAM GARRIGUE & COMPANY, CHICAGO

Among the definite contributions we have made to the industries in which we specialize are the following:

1. The principle of double effect glycerine distillation.
2. Separation of trimethyleneglycol from glycerine.
3. The recovery of dynamite glycerine from cotton-seed soap stock spent lyes.
4. Reversible double effect evaporation for spent soap lye.
5. The combined evaporation of caustic soda, lye and spent soap lye in triple effect.
6. Direct autoclaving of cotton-seed soap stock before distilling fatty acids.

We have also made decided improvements in the construction of vacuum evaporators, solvent extractors, fatty acid stills and soap machinery.

OIL EXTRACTION OR DEGREASING PLANTS

Garrigue extraction plants are suitable for two classes of service: (1) direct extraction of edible oil from copra, peanuts, corn germs, castor beans, soya beans, or any other oil bearing seeds; and also from oil cakes; (2) extraction of inedible oil from fuller's earth, animal tankage, garbage and bones.

GARRIGUE OIL EXTRACTION PLANT

In the manufacture of glue a great improvement can be made in the quality of the product by installing a Garrigue extraction plant to precede the glue boiling operation.

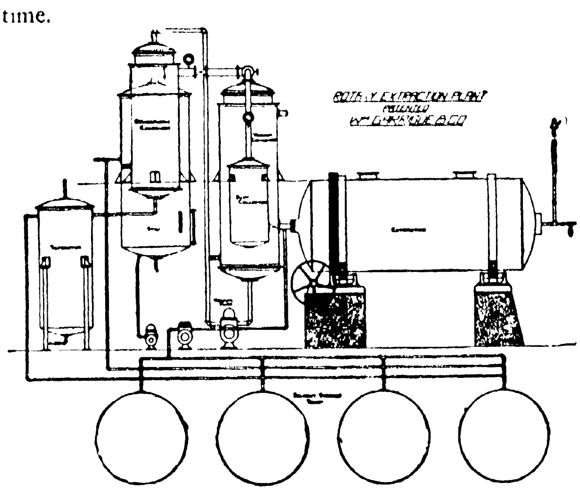
The Garrigue extractors are built in two types, one for the coarser material, such as bones, being a vertical cylinder, and the other for fine materials such as oil bearing seeds, being a horizontal rotating cylinder. The remainder of the plant consisting of still, condenser and storage tanks is practically iden-

Continued on Next Page

tical for both forms. A considerable number of these plants utilizing a variety of solvents are in successful operation in leading industrial establishments.

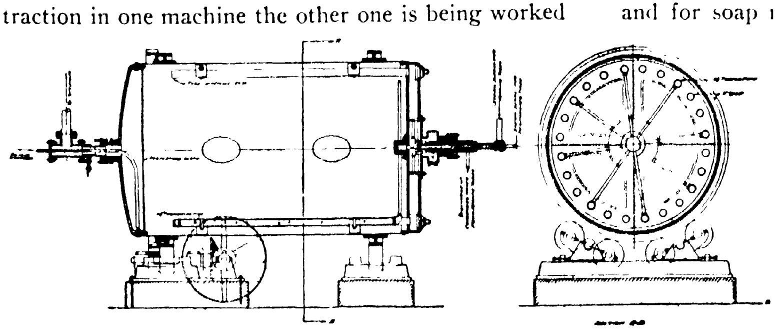
The illustration shows a plant with a single revolving extractor, although two or more extractors are frequently used. The extractor is operated under a vacuum. It is constructed with a steam manifold at one end.

The steam manifold has a series of boiler tubes fastened to the shell of the extractor and extending throughout its length. Steam from the manifold enters these tubes which serve to heat the solvent, to vaporize it and to dry the charge if necessary. At the center of the steam manifold is a rotary valve connected with a series of perforated pipes lying along the shell of the extractor between the heating tubes. The valve is constructed so that only the two lower perforated pipes are open to the steam at any one time.



The extractor is charged and then flooded with the solvent. After revolving a short time the solvent is pumped away through the filter to the storage tank feeding the still. The flooding of the charge is repeated several times to insure thorough extraction, the two middle storage tanks receiving this partially saturated solvent which is returned to the extractor on the following charge.

The last charge is always made with clean solvent. In installations having two extractors, during the extraction in one machine the other one is being worked for recovery of remaining solvent. For this reason it is always best to install two extractors when it is advisable to render the process continuous, which is usually the case.



GARRIGUE REVOLVING EXTRACTOR (PATENTED)

The solvent remaining in the extractor is vaporized with the dry steam in the tubes until most of it has been expelled, after which live steam is let in through the rotary valve and the perforated pipes, steam in the tube system being continued to prevent condensation in the material. The tumbling of the material speedily frees all of the solvent which passes with steam to the condenser.

The still is fed with the solvent removed from the first charge, which also is steamed to remove the last traces of the solvent. The solvent and steam together condense and flow through the separator into the clean solvent storage tank, the water automatically passing out through an overflow.

During recovery of the solvent, the extractor and the still, in the apparatus here shown, are operated under vacuum. Both oil and residue are obtained free from solvent.

A considerable saving in steam is effected by this type of extractor, due to utilizing the latent heat of steam in the tubes for recovering the solvent from the extracted material as against having to vaporize it with only the superheat of steam, as in the case of the vertical stationary extractor.

The material can be delivered with any percentage of moisture desired and the labor of emptying is entirely done away with.

SPLITTING OILS AND FATS

We build two classes of plants for splitting oils and fats:—The Autoclave plant (such as that shown in the illustration) and the Twitchell process plant. Whether the Autoclave process or the Twitchell process is more advantageous depends on the use to which the fatty acids are to be put.

The Autoclave plant serves either to split oils of good color obtaining white colored fatty acids without distillation, or else for splitting lower grade fats and oils, which are later distilled to produce light colored stock. When a light colored fatty acid is desired directly from stock, zinc oxide is used in the Autoclave, and for soap making purposes the zinc need not be removed from the product. If the final product is to be stearic acid the zinc is replaced with lime, or if zinc oxide is used it may be recovered for re-use.

When the color of the fatty acids is not of importance, and when it is intended to distil them afterwards, caustic soda or lime is used in the Autoclave in place of zinc oxide.

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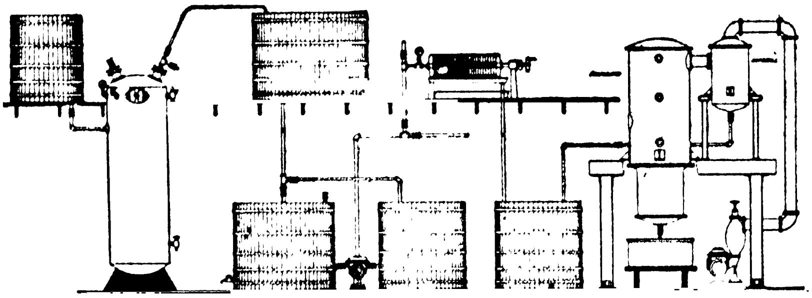


GARRIGUE AUTOCLAVE PLANT FOR FAT SPLITTING (PATENTED)

The glycerine waters from the splitting plant can afterward be recovered in Garrigue glycerine recovery equipment as described on page 499. The illustration of the Garrigue Autoclave plant for fat splitting shows a suitable glycerine recovery equipment operated in connection therewith.

When it is desirable to use Twitchell process, we install complete Twitchell plants, including equipment for making the Twitchell Saponifier. These plants are usually installed when the color of the product is not a prime consideration.

FATTY ACIDS DISTILLATION

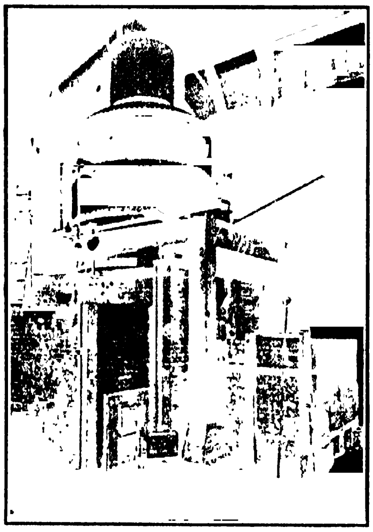
This process is applicable in the soap and stearic acid industries for the production of light colored fatty acids from recovered fats and refinery foots too dark to employ directly in soap making. The principal sources of raw material are cotton-seed soap stock, garbage grease, naphtha grease and dark bone grease and tallow.

A Garrigue plant for fat splitting followed by a Garrigue fatty acid distillation set, as shown in the illustration, gives a complete plant for working cottonseed soap stock, etc., into distilled fatty acids and crude glycerine.

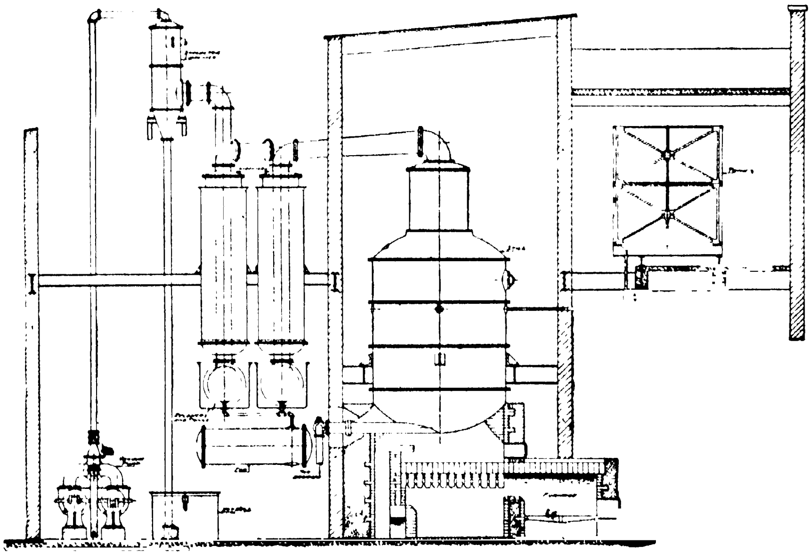
The soap stock is charged into the Autoclave and digested with steam only, and then blown into a lead-lined tank and boiled with sulphuric acid until the black fatty acids clear. The acid water is drawn from below the fatty matter to the glycerine tank, where it is neutralized with lime and filtered, after which it is treated in a manner similar to spent soap lyes, described under another heading. The black fatty acid is washed, and dried in the feed tank, and then fed continuously to the vacuum still, which is heated by direct fire and supplied with open superheated steam. The fatty acids distil, leaving a residue of "candle tar" or "stearine pitch." In the cases of grease or tallows, lime or caustic soda is added to the autoclave.

Garrigue fatty acid stills are of improved construction. A special furnace design is used in order to obtain uniform heat over the bottom of the still. This feature, together with our improved steam distributing system results in increased yield, improved color and fuel economy. The valve and control mechanism is also exceedingly simple and convenient.

The art in this operation is the production of a distillate as free as possible from color and odor and the obtaining of the maximum yield of fatty acids and the minimum yield of pitch. The art in construction, in addition to facilitating these, is to keep down repairs and depreciation, which can readily run into very high figures.



GARRIGUE FATTY ACIDS STILL
(PATENTED)



GARRIGUE FATTY ACIDS DISTILLATION SET
(Process and Equipment Patented)

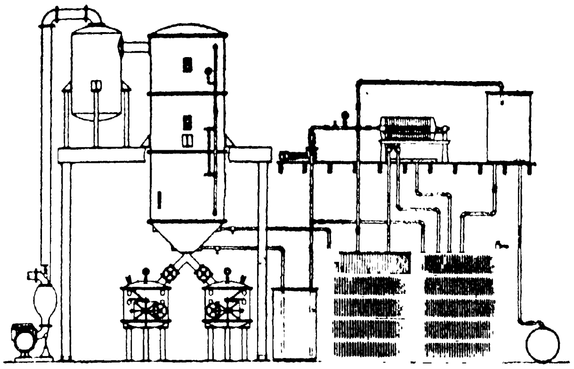
STEARIC ACID AND RED OIL PLANTS

We design complete plants for the production of all grades of red oil and triple pressed stearic acid. Our many years of experience in designing plants for this purpose enables us to lay out plants and supply the necessary equipment to attain the best results from the available material and under the special conditions of each installation. Although not builders of refrigerating machinery, we design refrigerating installations suitable for use in stearic acid and red oil plants, specifying equipment of leading manufacturers.

Continued on Next Page

CRUDE GLYCERINE AND GLYCERINE FOOTS PLANTS

Garrigue crude glycerine plants have been in successful operation for more than twenty-five years and are the result of careful observation and constant improvement covering that period of time. They practically eliminate loss of glycerine during recovery, and the yield of glycerine from the fats used in the soap kettle should, in good practise, be well above 90% of the glycerine obtainable from raw material, or equal to the practical yield obtained in fat splitting. The chief use of these plants is for the recovery of glycerine from spent soap lyes, from the glycerine waters of fat splitting plants, and from glycerine foots.



GARRIGUE GLYCERINE RECOVERY PLANT (PATENTED)

Any alkali is neutralized with sulphuric or muriatic acid and a compound of iron or aluminum or lime is added as a coagulating agent followed by filtration. In some cases the filtrate is further treated with acid to decompose acetates and similar salts. This feature constitutes our process for the reduction of the organic residue in crude glycerine and the reduction of fatty acids in distillates from crude glycerine.

The liquid is next evaporated in vacuum, during which the contained salt crystallizes out and falls into a salt extractor under the evaporator in which it is steamed or washed and from which it is removed for re-use in the soap kettles. This is continued until the evaporator contains a batch of soap lye crude glycerine which is dropped into a settling tank and any remaining acidity neutralized. The cut shows a complete plant of this kind with a small single effect evaporator. It is possible to avoid entirely corrosion of the evaporator and scaling of the tubes.

In the manufacture of half-boiled soap or lime soap for lubricating greases it is desirable to extract the glycerine from the fats directly, for which purpose either of the fat splitting plants described under another heading is used. In that case a glycerine water is settled from the resulting fatty acids which requires a chemical treatment and filtration followed by evaporation.

The chemical treatment varies with the kind of fat used and the purity of "saponification crude glycerine" it is desired to produce. As the liquors contain no salt the evaporator is used without the extractor. Otherwise the plant is as shown.

This grade of glycerine serves many commercial purposes, without distillation, if the liquors are treated accordingly, and also gives chemically pure glycerine in one distillation.

When crude glycerine is distilled, the residue, known as glycerine foots, always retains some glycerine and should be dissolved in water and treated similarly to spent soap lye. In all ordinary cases it pays well to re-work these glycerine foots.

GARRIGUE GLYCERINE RECOVERY PLANT SHOWING EVAPORATORS

GLYCERINE REFINING PLANTS

To produce "Dynamite Glycerine or Chemically pure Glycerine" from crude glycerine, the "double effect" principle and "heat regenerator" principle are made use of by injecting into the still, instead of steam, the vapor from evaporating the weak glycerine water and by superheating this vapor with the hot vapor from the still. The diagrammatic cut below shows these features.

The crude glycerine is heated in the still by means of the steam coil and distils over in an atmosphere of steam issuing from the perforated spider.

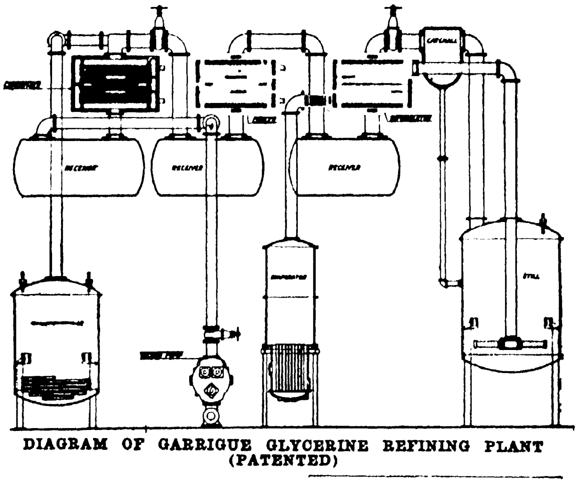


DIAGRAM OF GARRIGUE GLYCERINE REFINING PLANT (PATENTED)

Continued on Next Page

A catch-all serves to stop entrainment of salt particles. The vapor enters the superheater where most of the glycerine condenses on the copper tubes, giving up its heat to the vapor inside the tubes, and which is on its way to the spider in the still. The condensed glycerine drops into the concentrator The remainder passes to the "cooler," or first surface condenser. The tubes in this are supplied with warm water and serve to condense most of the remaining glycerine, which also drops to the concentrator. The temperature of the water is controlled to allow a very little glycerine to enter the final surface condenser along with all the water vapor from the still spider, and also carrying some acetic acid, always present in crude glycerine, which it is necessary to separate from the main distillate in this way.

A GARRIGUE GLYCERINE REFINING INSTALLATION

The final condensation is made complete with cold water in the tubes, and the condensate flows to the "Evaporator," in which it is continually being boiled by means of a coil heated with the exhaust from the still coil. The vapor resulting from this boiling is lead through the superheater to the still spider, and the glycerine carried beyond the cooler is accumulated in the evaporator.

The rate of distillation is controlled by the valve supplying steam to the evaporator coil. The glycerine in the concentrator is maintained at the desired specific gravity by controlling the steam supply to its coil and reading the temperature on an inserted thermometer, the water evaporated passing to the final condenser. If the crude glycerine contains trimethyleneglycol, most of it will have passed into the evaporator; any remaining in the concentrator charge is driven out by superheated water vapor from the spider in the bottom of the concentrator, after the water has been evaporated from the charge. The trimethyleneglycol and glycerine in the evaporator are separated by the usual process of fractionation, for which purpose the evaporator and condenser and receiver are operated as a separate unit. A vacuum is maintained throughout the system by a single pump connected to the receiver under the condenser.

There are no losses inherent in this process, as the temperature cannot get above that of the boiler supplying steam, which is much below glycerine decomposition and the arrangement of the plant makes mechanical loss impossible. In practise, where the residue in the still is properly treated, which is described under "Crude Glycerine" on a preceding page, a full yield of glycerine is obtained. The distilled glycerine is filtered with decolorizing carbon. The entire operation is simple and cheap, and the plant is not subject to any material depreciation. It makes a decided saving of fuel over the older methods

EVAPORATORS: SINGLE AND MULTIPLE EFFECTS

Our evaporators are of the vertical water tube type and are applicable to a wide variety of liquids, and have special merit for liquids depositing crystals during concentration. They are specially suitable for spent soap lyes. They are made in any number of effects and of different metals suitable to the work.

Mysterious failures to obtain full yields are usually traceable to evaporator losses. We have designed a special catch-all which we consider to be the best device in use for stopping entrainment losses. With the dry system of condensation we elevate the catch-all level with the barometric condenser dropping a barometric column from the catch-all into an open tank where the operator can see if the charge boils over and in which the excess liquid can be held out until the proper conditions are reestablished in the evaporator.

In describing this excellent machine we introduced the subject of safety devices first, because this is the feature we have studied most and about which least is usually said.

Operating on costly materials, we have tried to give the smallest opportunity for frothing or for entrainment and then have added means for checking these if they occur. In evaporators for non-crystallizing liquors we introduce the steam in the center of the calandria around the small boiling tubes and baffle it so that it effectually comes in contact with all the heating surface, and we vent the calandria at the outside or coolest part, where there is a row of larger tubes for downward circulation. Thus the direction of the liquid is from the middle to the sides, from a smaller to a larger area, from a hotter to a cooler zone, and the combined area of the down-comers is relatively large in cross section and entirely out of the way of upward gushes, all of which makes for the best circulation.

GARRIGUE EVAPORATOR SHOWING LOWER PORTION OF CALANDRIA, SALT BOXES AND PUMP

The vapor space is made wider than the calandria to allow room for the waves of liquid from the center to flatten out and also to make an expansion diaphragm of the upper tube sheet to prevent leakage at the tube ends from expansion strains.

To prevent entrainment there is a conical dash-plate carried on the steam inlet pipe, the outer edge of which is curved down so that any liquor thrown against it is projected to the down-comers.

We have also developed a crystallizing evaporator, the calandria of which is of the basket type. The calandria basket is so located in the body of the evaporator that there is an annular ring between the outside of this basket and the body of the evaporator.

The crystals pass down through this annular ring and (the current at the bottom of the evaporator being inward) they are swept toward the center and pass through a cone into the salt box or receiver.

The current at the bottom of the evaporator being inward sweeps out deposited salts.

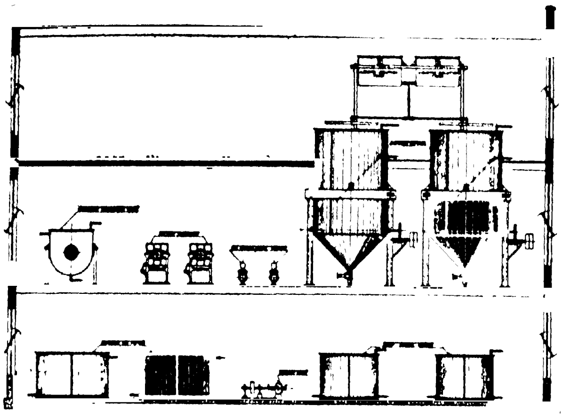
The bottom of the salt extractor has a fine screen on which the crystals rest. When the extractor is filled, as seen through sight glasses, the valve is closed and the adhering liquid blown from the crystals with steam let into the top of the extractor, this liquid returning to the evaporator. In glycerine work the crystals are sometimes washed. The larger machines have two extractors, one of which is always open. The reversible double effects have three extractors, the central one connected to both evaporators. As crystals separate only in the second effect, the arrangement allows two extractors for that effect.

Continued on Next Page

EDIBLE OIL REFINING, BLEACHING AND DEODORIZING

The Garrigue engineering staff has had extensive experience in the installation of refining, bleaching and deodorizing plants for vegetable oils.

Garrigue engineers not only understand the operation of the equipment involved in the processing of oils, but are also thoroughly experienced in the proper methods to be used to handle any particular oil with the least processing loss. The plants are built to meet our customers' particular needs, and equipment is designed and sizes proportioned accordingly. These plants are suitable for cotton-seed, peanut, cocoanut, corn, soya bean, palm kernel and other vegetable oils.



GARRIGUE OIL REFINING PLANT (PATENTED)

HYDROGENATION

We design and erect complete plants for hardening (hydrogenating) vegetable and animal oils, including equipment for the generation of hydrogen.

OLEOMARGARINE AND VEGETABLE MARGARINE PLANTS

We not only design and completely equip factories for the manufacture of butter substitutes, such as oleomargarine and nut margarine, but also place such plants in operation, supplying necessary formulas and instructions on method of processing, should this be desired.

CAUSTICIZING SODA ASH

The process is applicable in soap works, oil refineries, and wherever caustic lye is used in a fairly dilute state. It pays well to do the causticizing where the lye is used. We are prepared to furnish complete causticizing plants, including a suitable caustic evaporator.

GARBAGE REDUCTION AND RENDERING

We were the first in this country to build a garbage reduction plant to carry out the process that has outlived the others for economy, consisting of digesting, pressing, drying, extracting and evaporating the tank water.

This process is sometimes objectionable on account of the difficulty of destroying the odors arising, in which case our revolving extractor provides a complete garbage reduction plant in itself. The same applies to fish rendering.

The material is cooked, grease or oil run off, the residue dried and then extracted. The only outlet is the discharge from the vacuum pump which can be led to the furnace under the boiler. The operation is particularly attractive to small plants, and provides a very profitable means of disposing of this waste.

SOAP MANUFACTURE

Our long experience in this field enables us to act in a consulting or advisory capacity in the manufacture of laundry soap, milled toilet soap, transparent soaps, textile or chip laundry soap, soap powders, scouring powders, etc. We are in a position to design and equip complete plants for any of the above.

GARRIGUE SOAP POWDER ROLLS
(PATENTED)
Double Roll Process

We have devoted particular attention to the manufacture of soap powder. The Garrigue double roll process, utilizing both water-cooled and brine-cooled rolls, enables the production of light fluffy soap powder in fifteen minutes instead of taking two and a half days, as in the old process. Moreover, the Garrigue system requires only one handling of the material instead of four, and occupies only one-quarter the floor space.

SPECIAL APPARATUS

We are equipped to turn out in our own shops the most modern types of stationary or rotary dryers, stills, kettles, autoclaves, digesters, tanks, coils, special equipment, etc. All kinds of special castings for chemical equipment made and machined.

A FEW REPRESENTATIVE USERS OF GARRIGUE EQUIPMENT

Armour & Company, Chicago, Ill.
Swift & Company, Chicago, Ill
Wilson & Company, Chicago, Ill
Andrew Jergens Company, Cincinnati, Ohio
Lever Brothers, Ltd, Toronto, Ont, Canada
Los Angeles Soap Company, Los Angeles, Calif
The Southern Cotton Oil Company, Savannah, Ga
United States Glue Company, Milwaukee, Wis
Peet Bros Mfg Company, West Berkeley, Cal
B T Babbitt, Inc, Babbitt, N J
Citrus Soap Company, San Diego, Cal
Cape Explosives Works, Ltd, Cape Town, So Africa
Compania Comercial de Fomento de Cuba, Cardenas, Cuba
Alfonso Ansoleaga y Hno, Mexico City, Mexico
Mitsui & Company, Yokohama, Japan
Other names in your section on request

INQUIRIES SOLICITED

We are always glad to send drawings and descriptions of our plants and processes, and information to prospective users regarding yields and costs.

Inquiries for Export Trade will always have most careful attention. We have built plants for erection in many parts of the world and are especially well equipped to handle this class of business.

GENERAL BAKELITE COMPANY

2 RECTOR STREET, NEW YORK, N. Y.
WORKS: PERTH AMBOY, N. J.

BAKELITE
Reg. U.S. Pat. Off.

PRODUCT

Bakelite—A synthetic condensation product of carbolic acid and formaldehyde.

BAKELITE

The product Bakelite results from a patented process in which carbolic acid and formaldehyde react to form a synthetic resin-like material. The raw Bakelite is both soluble and fusible, but has the unique property of becoming insoluble, infusible and very hard, strong and resistant after being subjected to heat.

Bakelite is manufactured and furnished to the trade in the following forms:

BAKELITE MOLDING MATERIAL

A plastic material in powder or sheet form for hot hydraulic press molding. Must be molded in steel dies under pressure of approximately 2000 lb. per square inch, at a temperature of 350° F. Average molding time, 6 to 12 minutes.

BAKELITE VARNISH

A coating and impregnating material for electrical coils, windings and insulation. Highly dielectric and heat resisting. Impervious to oils, water, solvents, and most chemicals. Hardened by baking.

BAKELITE ENAMEL

An opaque coating to protect metal surfaces against corrosion and the action of chemicals. Effective as an insulating covering for metal parts on account of its dielectric strength, hardness and resistance to heat. Baked, after application, at 250° F. for 2 hours.

BAKELITE LACQUER

A hard, transparent coating for highly finished metal. Resists solvents, gases, water and perspiration. Baked, after application, at 275° F. for 20 minutes.

BAKELITE CEMENT

A technical cement for bonding glass, metal, porcelain, etc. Extremely hard and tenacious; exceptionally resistant to heat, solvents and most chemicals. Requires baking after application.

BAKELITE, CLEAR, TRANSLUCENT AND COLORED

A transparent or translucent material, of amber or other color, used for pipe stems and cigar holders; fancy fountain pens, buttons, handles; jewelry and other novelty goods. Odorless, tasteless and non-inflammable.

EXAMPLES OF BAKELITE SHEET, ROD, AND TUBE

BAKELITE SHEET, ROD AND TUBE

A laminated product manufactured from certain grades of paper and fabric processed with Bakelite. Characterized by unusual strength, resiliency and toughness. Possesses high dielectric strength. Exceptionally resistant to heat, oil, water and most chemicals. Will not warp or deteriorate with age. Can be machined and punched.

Used for a wide range of electrical and mechanical applications requiring maximum strength, high insulating quality and heat resistance.

BAKELITE, MOLDED

EXAMPLE OF MOLDED BAKELITE

A finished product molded accurately to dimension with a clear sharp finish from the die; metal inserts can be molded exactly in place. Combines great dielectric and mechanical strength, with high heat resistance. Can be machined and polished. Is non-hygroscopic, impervious to water, steam, oils and solvents and is chemically inert. Does not bloom, change color or deteriorate with age. Used for electrical insulators and mechanical parts.

BAKELITE SPECIAL MATERIALS

A research laboratory is maintained by the General Bakelite Company for the working out of special applications of Bakelite in its various forms.

GENERAL OIL GAS CORPORATION

511 Fifth Avenue
NEW YORK, N. Y.

PRODUCT

The Dayton Process Apparatus for the manufacture of Oil Gas.

THE DAYTON PROCESS

The Dayton Process solves the problem confronting the manufacturer for whom constantly increasing coal or fuel oil bills, or the ever-decreasing supply of natural gas have become questions of vital importance.

The Dayton Process apparatus affords a means of generating a cheap gas, with low investment charges, and a substitute for direct firing of fuel oil which will effect large savings in total fuel consumption.

Its operation is simple and automatic and requires **less than one-third the operating labor** of any other producer.

It is remarkably compact, and produces a gas suitable for all purposes.

Dayton Gas can be burned in equipment designed for standard illuminating gas or natural gas with minor adjustment.

It is particularly adaptable to uses that require a clean, sulphur free, uniform gas and high flame temperatures without regeneration.

As an auxiliary equipment to supplement natural gas without change of equipment it is without equal.

OUTSTANDING FEATURES OF THE PROCESS

The principal points of difference between the Dayton process and other types of artificial gas generators are as follows:

1. The process herein described is independent of intermittent and external heating.
2. The process is automatic, continuous, and self-sustaining.
3. The B.t.u. value desired can be selected, and when the apparatus is once adjusted this heat content is automatically maintained without variation.
4. The only raw material necessary for the production of 1000 cu. ft. of 450 to 500 B.t.u. gas is 4.0 gal. of residuum or fuel oil.
5. The gas produced is clean and free from sulfur, thus requiring no purification, regardless of the sulfur content of the oil used.
6. The equipment is compact and requires little floor space. A plant with a capacity of 1,000,000 cu. ft. per day of 450 to 500 B.t.u. gas can be housed in a room 30 ft. x 50 ft.
7. No gas storage is required, the gas-make being automatically regulated by the demand.
8. The labor requirements are but one man per shift for a plant of 1,000,000 cu. ft. capacity per day.
9. After a complete shutdown for 24 hrs. or longer, the equipment can be brought to capacity in less than 0.75 hr.

WRITE US FOR FURTHER INFORMATION

GENERAL CERAMICS COMPANY

Manufacturers of Acid Proof Stoneware

Main Office: 50 Church Street, NEW YORK, N. Y.
WORKS: KEASBEY, N. J.

PRODUCTS

A Complete Line of Acid Proof Chemical Stoneware including:

- Acid Elevators — automatic and non-automatic
- Carboy Stoppers
- Check Valves
- Chlorine Generators
- Coils
- Crystallizing Vessels
- Dampers
- Decanting Pots
- Dipping Baskets
- Exhausters
- Faucets of all Kinds
- Filters
- Foot Valves
- Funnels
- Injectors
- Jars
- Kettles
- Laboratory Sinks
- Lanterns
- Mariotte Bottles
- Mortars
- Nitrating Vessels
- Percolators
- Photographic Tanks
- Pipes of all Kinds
- Pots
- Pumps— Plunger and Centrifugal
- Pumps for gases
- Receivers
- Retorts
- Safety Valves
- Stills
- Stirrers
- Storage Vessels
- Subliming Dishes
- Suction Filters
- Siphons
- Tanks
- Tourills
- Towers
- Vacuum Kettles
- Valves
- Vats

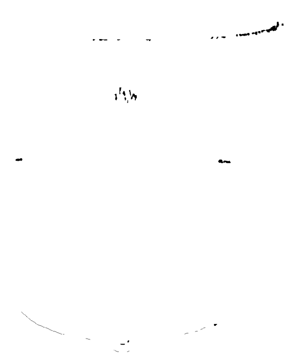
We design and install complete plants ready for operation, for the manufacture, recovery and storage of acids and other corrosive products

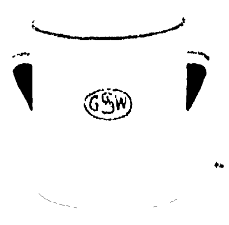
Our Chemical Engineering Department is at your service for estimates and full particulars

POTS

Capacity of 6 gallons to 265 gallons. Can be furnished with covers, and with or without bottom outlet.

ACID PITCHER

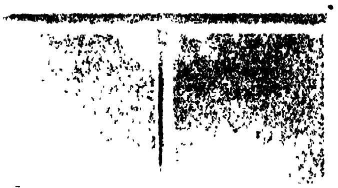




CYLINDRICAL ACID POT
With Ball Handles

RECTANGULAR TANKS

Made in capacities from 4 gallons up to 1,000 gallons and up to 11′ 0″ long.

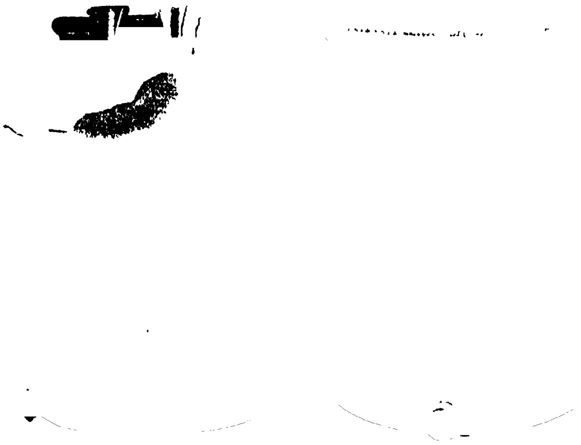


STORAGE VESSELS

Capacities, 130 gallons to 1,050 gallons. Furnished with or without bottom outlet.

CYLINDRICAL VESSELS

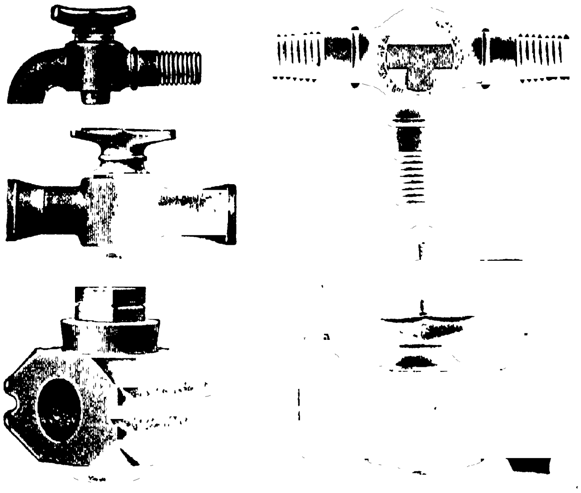
Capacities, 14 gallons to 1,125 gallons Can be furnished with covers, and with or without bottom outlet.



FAUCETS

Below we illustrate a few styles of the great variety of faucets we manufacture

Sizes 3/8″ to 4″ inside dia Larger sizes to order.



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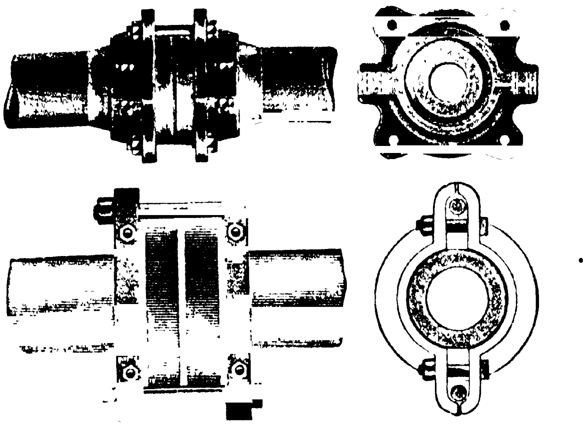
PIPES

Flanged pipe can be furnished in all diameters up to 6″ Larger pipes to special order.

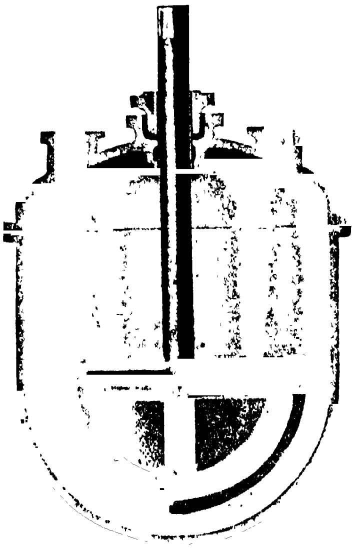


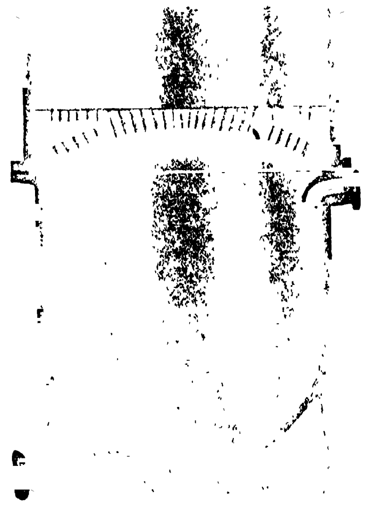
Socket pipe can be furnished in any diameter up to 48″

All styles of pipe can be furnished complete with elbows, tees, Y's, faucets, and other fittings

STILLS AND KETTLES

Made in all capacities up to 165 gals Can be furnished complete with ground on air tight covers and stirrers as illustrated





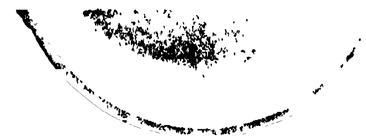
SUCTION FILTERS

Made in a variety of sizes from ½ gal for laboratory purposes, to 90 gal. for industrial purposes. In the larger sizes the sieve plates are arched on the under-side and will safely resist the pressure due to a complete vacuum.

EVAPORATING DISHES

Shallow:

Capacities from ¼ gal up to 42 gal



Hemispherical:

Capacities 8½ gal up to 120 gal

PUMPS

Plunger pumps are furnished in capacities from 7 gallons per minute to 85 gallons per minute

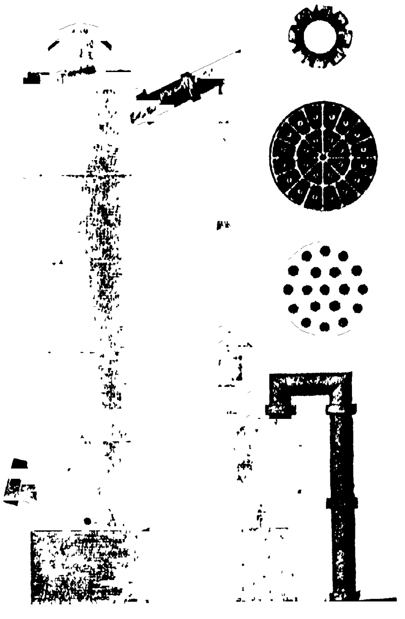
Centrifugal pumps are made in two sizes in capacities up to 350 gallons per minute

CENTRIFUGAL PUMP

TOWERS

In standard sizes, also special types such as the Kypke Star Plate Tower and the well-known Lunge Plate Tower

For the absorption and condensation of gases, in connection with the manufacture of muriatic, nitric, sulphurous acids, etc., nitric acid recovery plants, gas drying plants and installations for handling waste gases. We are prepared to furnish and install complete equipments for the above purposes.

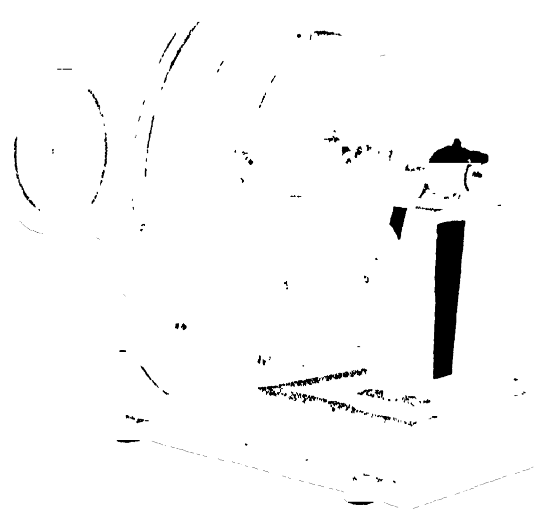


TOWER INSTALLATION

Continued on Next Page

EXHAUSTERS

For acid gases, made in four sizes for 4″, 6″, 8″ and 12″ gas connections; so designed that chemical stoneware alone comes in contact with the gas. These machines are encased in an iron shell.

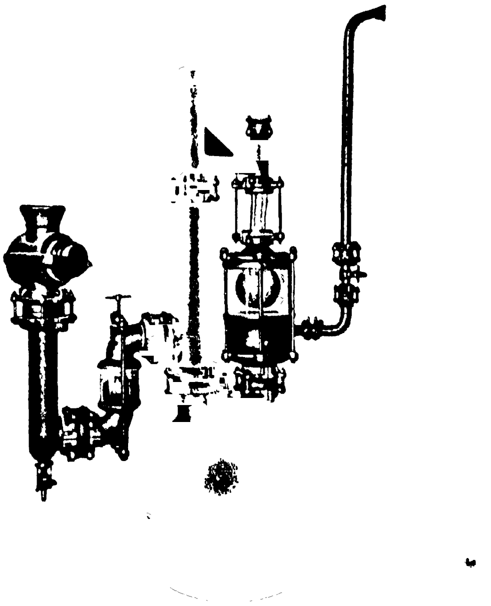


ACID ELEVATORS, NON-AUTOMATIC

These acid elevators or Montejus or blow-cases are furnished in capacities from 15 gallons to 525 gallons. They can be furnished, if desired, completely encased in a cast-iron shell for use against heavy pressure.

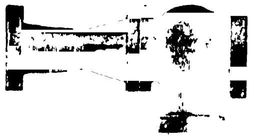
AUTOMATIC ACID ELEVATORS

The Plath automatic acid elevator is furnished in three sizes, having capacities of 530, 1,060 and 1,600 gallons per hour, respectively. The Securius pattern is made in two sizes having capacities of 260 and 530 gallons per hour, respectively. Either type is suitable for elevating any corrosive solution and requires no attention beyond a constant supply of compressed air.



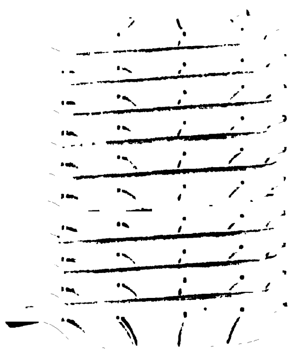
PLATH AUTOMATIC ACID ELEVATOR

INJECTORS



For moving liquids by means of steam, or gases by means of steam or compressed air

COILS



Made in a large variety of sizes from 3/8″ to 3″ bore and 17′ 0″ to 90′ 0″ length of tube.

For condensation of nitric acid and distillation and rectification of organic acids under vacuum or normal pressure. Also made with raised outlet for heating and cooling liquids.

CELLARIUS TOURILLS

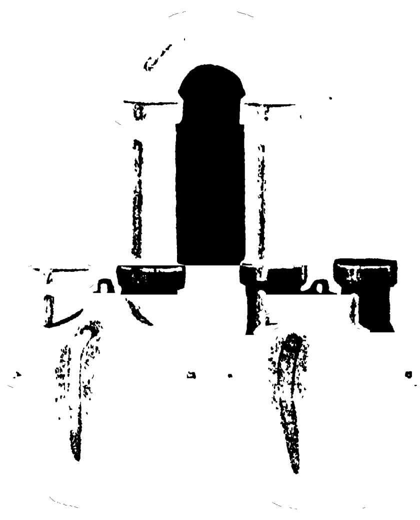
Made in three sizes for 6″, 8″ and 12″ gas connections for muriatic acid.

TOURILLS (RECEIVERS) FOR CONDENSATION OF NITRIC ACID

6 gal. to 150 gal. capacity.

Also to special design for condensation under vacuum.

These vessels can be furnished with dip pipe to serve as Woulff's bottles, and with overflow tubes for the manufacture of muriatic acid.



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ACID AND TEMPERATURE RESISTING PURE FUSED SILICA

Fused Silica is produced by our own process covered by our own patents. It is made in various finishes such as opaque, smooth inside, and rough sandy finish outside, glazed, semi-transparent, smooth inside and outside and absolutely transparent. The latter grade represents the latest development in the fusing of Silica.

A Complete Line for the Laboratory and for Plant Equipment.

BEAKERS, (glazed) from 50 cc to 800 cc

CAPSULES, circular or rectangular, from 7 cc to 75 cc.

CASCADE PLANT for the Concentration of Sulphuric Acid.

CASSEROLES, from 30 cc. to 350 cc.

COMBUSTION BOATS, from 1¾" to 6" in length.

COMBUSTION TUBES, glazed or unglazed, plain ends, closed, reduced end, or with transparent section.

COILS, from ⅛" to 2" bore, in lengths up to 60 feet.

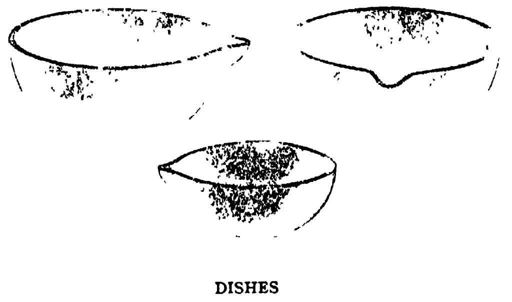
CONCENTRATION DISHES, in standard sizes

CONDENSING APPARATUS, to special design

CRUCIBLES, glazed or unglazed, standard or special sizes, from 10 cc. up to 22500 cc.

CRUCIBLES

DISHES, glazed or unglazed, flat or deep shape, from 20 cc. up to 22500 cc.



DISHES

FLASKS, semi-transparent, from 50 cc. up to 1000 cc.

GLOVER TOWER LIPS AND GUTTERS, standard.

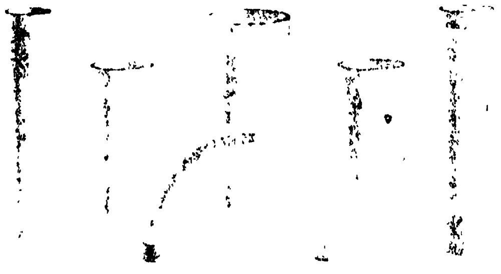
GOOCH CRUCIBLES.

MUFFLES, rectangular, curved sides or straight sides, with curved top.

PIPES, Fused Silica Pipes are made either with plain ends or with sockets. They are practically indispensable for installations where stoneware piping cannot be used because of the high temperature of the liquid or gas. The inner surface of the pipes is smooth.

Special sizes and shapes are made to customers' drawing

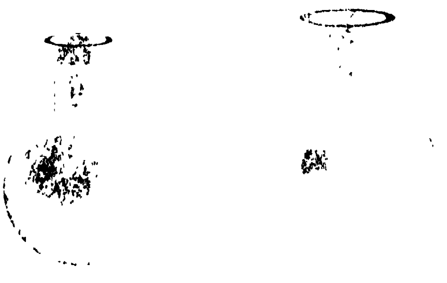
Straight, plain ends or socketed, taper shape, from 1/32" to 18" bore.



PIPES

PLATES, opaque, glazed or semi-transparent.

RETORTS, up to 75 litres capacity.



RETORTS

RODS, up to 6 feet in length.

S-BENDS, up to 9" bore and 78" length.

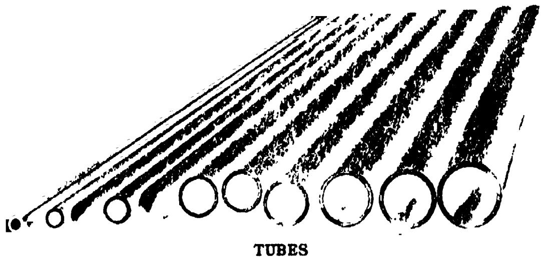
STILLS, made to special design.

TANKS, up to 10 gallons capacity.

TRAYS, four-sided or three-sided, up to 16¾" in length.

TRIANGLES, all silica, nickel or nichrome.

TUBES, Fused Silica Tubes are recognized to be superior either to glass, porcelain or platinum, especially in combustion work. The tubes may be had either with thin or heavy walls. They are furnished with ends fused smooth and round, for rubber stopper, glazed, unglazed, up to 4½" bore, in lengths up to 10 feet



TUBES

SPECIAL APPARATUS MADE TO CUSTOMERS' OWN DRAWINGS. ASK FOR OUR CATALOG NO. 4.

GENERAL ELECTRIC COMPANY

GENERAL OFFICE: SCHENECTADY, N. Y.

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Arizona, Phoenix
Arkansas, Little Rock
California, Los Angeles
California, San Francisco
Colorado, Denver
Connecticut, Hartford
Connecticut, New Haven
District of Columbia, Washington
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Tennessee, Nashville
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*Texas, Houston
*Texas, San Antonio
Utah, Salt Lake City
Virginia, Richmond
Washington, Seattle
Washington, Spokane
Washington, Tacoma
West Virginia, Bluefield
West Virginia, Charleston
Wisconsin, Milwaukee

*Southwest General Electric Co.

DISTRIBUTOR FOR GENERAL ELECTRIC COMPANY OUTSIDE OF THE UNITED STATES

INTERNATIONAL GENERAL ELECTRIC CO., INC.

GENERAL SALES OFFICES: 120 Broadway, New York; Schenectady, N. Y.

FOREIGN REPRESENTATIVES

Argentina: General Electric, S. A., Buenos Aires
Australia: Australian General Electric Co., Ltd., Sydney and Melbourne
Belgium and Colonies: Societe d'Electricite et de Mecanique Procedes Thomson Houston & Carels Societe Anonyme, Brussels
Bolivia: International Machinery Co., La Paz and Oruro
Brazil: General Electric, S. A., Rio de Janeiro and Sao Paulo
Canada: Canadian General Electric Co., Ltd., Toronto
Chile: International Machinery Company, Santiago, Antofagasta and Valparaiso
China: Anderson, Meyer & Company, Ltd., Shanghai; International General Electric Co., Inc. (General representatives of the Far East, excluding China and Japan), Shanghai
Colombia: Wesselhoeft & Poor, Medellin, Barranquilla and Bogota
Cuba: General Electric Company of Cuba, Havana and Santiago
Dutch East Indies: International General Electric Co., Inc., Soerabaia, Java.
Ecuador: Carlos Cordovez, Guayaquil
Egypt: British Thomson Houston Co., Ltd., Cairo
France and Colonies: Compagnie Francaise Thomson Houston, Paris
Great Britain and Ireland: British Thomson-Houston Co., Ltd., Rugby; International General Electric Co., Inc., London
Greece and Colonies: Compagnie Francaise Thomson Houston, Paris, France
India: British Thomson-Houston Co., Ltd., Calcutta and Bombay; International General Electric Company, Inc., Calcutta
Italy and Colonies: Franco Tosi Societa Anonima, Milan.
Japan: International General Electric Co., Inc., Yokohama; Shibaura Engineering Works, Tokyo; Tokyo Electric Co., Ltd., Kawasaki
Mexico: Mexican General Electric Co., City of Mexico and Guadalajara.
New Zealand: National Electrical & Engineering Co., Ltd., Auckland, Dunedin, Christchurch, and Wellington.
Paraguay: General Electric, S. A., Buenos Aires, Argentina
Peru: W. R. Grace & Co., Lima
Philippine Islands: Pacific Commercial Company, Manila
Porto Rico: International General Electric Co., Inc., San Juan
Portugal and Colonies: Sociedad Iberica de Construcciones Electricas, Madrid, Spain.
Russia: Wseobshtchaia Electricheskaia Kompania, Petrograd and Vladivostok
South Africa: South African General Electric Co., Ltd., Johannesburg and Cape Town
Spain and Colonies: Sociedad Iberica de Construcciones Electricas, Madrid, Spain
Uruguay: General Electric, S. A., Montevideo
Venezuela: Wesselhoeft & Poor, Caracas

PRODUCTS

The General Electric Company manufactures complete electrical equipment for industrial chemical plants.

The fabrication of this immense line of electrical machinery and supplies is carried on in a number of plants equipped with every feature tending toward quality manufacture and prompt delivery.

Many industrial plants standardize on G-E equipment, because of the advantage of having all electrical equipment built by one company and assembled ready for operation.

So general is the use of electrical equipment in the modern industrial chemical plant that it is hardly an exaggeration to say that the present day development of these industries can be attributed to the high development of electrical machinery as much as to any one other factor. The General Electric Company has contributed largely to this development by producing equipment for generating and distributing the necessary electrical energy; motors and control for utilizing that power; special equipment for electrothermal and electrolytic applications; and still other electrical apparatus for industrial lighting.

In these pages it is attempted to give a very condensed survey of the electrical products which the Company has to offer the chemical engineer. These descriptions are grouped by general divisions as follows:

G-E Laboratory Service..........Page 509
Electro-Chemical Plant Equipment " 510
Electro-Thermal Applications..... " 511
Applications for Motor Drive..... " 513
Miscellaneous G-E Products...... " 515

SERVICE TO CHEMICAL INDUSTRIES

It should be remembered that no list or display of G-E products is necessarily complete as the Company is constantly developing new machinery, devices and materials. Consequently, it is always advisable when contemplating the erection of new plants or additions in which electrical equipment is used, to get in touch with the Company's General Office or nearest Branch Office.

G-E specialists are prepared to assist those in charge of the design, erection or operation of industrial chemical plants and to select the most suitable electrical equipment. They invite the opportunity to cooperate with chemical plant engineers.

Other manufacturers receive cordial cooperation from the General Electric Company in developing the electrical features of their machinery, which can readily be obtained with G-E products incorporated by specifying "G-E" when the machinery is purchased.

WHERE TO GET G-E PRODUCTS

Contact with users of G-E equipment is maintained through sales offices, listed above, which embrace the whole country. G-E Distributing Jobbers are located in all large cities, and warehouses, conveniently placed, insure prompt delivery of orders from sales offices or jobber.

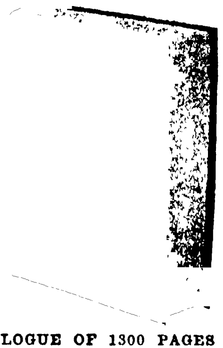
G-E motor dealers, whose stores are headquarters for standard motors and motor repair service, are located in every city and large town. Electrical supply stores sell G-E merchandise products—small electrical devices, usually packaged.

Continued on Next Page

G-E DESCRIPTIVE PUBLICATIONS

To assist in the proper selection, operation and maintenance of G-E equipment and supplies many publications are available.

The General Catalogue, issued annually and distributed to users of G-E equipment, gives descriptions and data on practically all G-E products, and, in some cases, identification for ordering. Special bulletins and booklets give more detailed information on many subjects. Bulletins describing some of the many G-E products having application in industrial chemical plants are referred to on the following pages and are readily obtainable upon request from G-E Sales Offices. In requesting bulletins, promptness in reply will be facilitated by referring to bulletin number.



G-E ANNUAL CATALOGUE OF 1300 PAGES DISTRIBUTED TO PURCHASERS OF G-E EQUIPMENT

To insure proper assembly and operation of equipment, special information in the form of instruction books and cards, drawings and connection diagrams accompanies shipment. Additional copies of these are gladly furnished whenever required.

Renewal Parts Catalogues covering industrial equipment, make it easy to order renewal parts and thus maintain equipment with supplies made by the original manufacturer. Each catalogue contains views of the component devices, giving accurately the name of individual parts and the proper ordering numbers.

G-E supply parts bulletins are also available, which enable the user to specify parts accurately and quickly.

G-E RESEARCH FACILITIES

The General Electric Company's research laboratories are known to the scientific public throughout the world as among the most extensive and best-equipped institutions of their kind. In these laboratories new products are constantly being produced which eventually find their way into commerce, instituting important improvements and opening up new lines of industry.

Much of this research would seem to be only remotely related to the activities of the Company but much effort is devoted each year to investigation in theoretical physics, chemistry and engineering. It is only by carrying on a great amount of this work that new developments can be achieved.

Here are mentioned a few products which have been developed as a result of research and which are offered for sale as they may prove of value. In addition there are a number of special products desirable mainly for experimental use, such as pure argon gas, metallic calcium, silicon tetrachloride, and titanium tetrachloride. For further information write the Supply Department, General Electric Co., Schenectady, N. Y.

THE G-E RESEARCH LABORATORY AT SCHENECTADY, N. Y.

A Suggestion to Investigators—The G-E research laboratory, because of the variety of its work, frequently has occasion to make up materials not otherwise readily obtainable and to investigate their properties. Although the Laboratory would willingly in most cases give others the benefit of its experience, the results often are not of sufficiently general interest to warrant publication.

It is, therefore, suggested that any worker in science who needs and does not know where to obtain some special material or information, write to the G-E Research Laboratory. If it is available, either information or material will be gladly supplied. If not, as may often happen, the Laboratory may be able to suggest where it can be obtained or how produced. Such inquiries should be addressed to the Company's Research Laboratory, Schenectady, N. Y.

The Arsem Vacuum Furnace for obtaining very high temperatures, comprises a heater enclosed in a vacuum chamber, the heater being of such shape that it almost entirely encloses the article to be treated, but is provided with windows for observing behavior of contents. Two types are made—a vertical type and a box type. (Bulletin 49711.)

The following uses may be mentioned:

Preparation of metals, alloys and various compounds.

Determination of melting points by an optical pyrometer or by reference to the furnace calibration curves.

Calibration of optical pyrometer.

Distillation of refractory substances for separation or purification.

Study of equilibrium in the reaction depending upon the pressure of the gaseous phase.

Vacuum Pumps—The Langmuir condensation pump is an improved form of pump for obtaining very high vacua. With this pump there is no definite lower limit (other than zero) below which the pressure cannot be reduced Pressures as low as 10^{-4} bars can be obtained. It is designed for high speed (3000 and 4000 c c. per second).

Also a two-stage rotary oil vacuum pump, developed primarily as a rough or backing-up pump to be used with the Langmuir condensation pump. It can be supplied with or without the latter or without motor. With this pump driven by motor, a pressure of .001 mm. of mercury can be obtained.

Kenotron—A rectifier for obtaining very high voltage; direct current, which is found valuable for producing current for spectroscope work, operating small discharge tubes, cable testing, and for electrical precipitation of fumes and smoke. It is used in connection with the Cottrell process mentioned on page 517.

KENOTRON

Kenotrons can be supplied in four standard sizes rated as follows:

100,000 volt, 100 milliampere, 100,000 volt, 250 milliampere, 20,000 volt, 100 milliampere, and 10,000 volt, 100 milliampere.

Boron Carbide, or Boroflux as it is known, is a deoxidizer used in casting mechanically sound copper castings of high electrical conductivity. By the use of this flux, under ordinary foundry conditions, a conductivity of 85% or better is readily obtained. Under careful conditions, this will be 90 to 95%.

Genelite is a synthetic bronze containing approximately 40% by volume of graphite distributed evenly throughout its mass. This metal for light-duty bearing purposes, may be used without additional lubrication, and also

Continued on Next Page

has unusual qualities when operated for heavier duty with lubrication.

Water Japan is a non-inflammable japan, water taking the place of the usual inflammable solvent and, therefore, all fire risk is eliminated by using this material.

It is used in practically the same manner as ordinary japans except that the parts to be treated are preheated before they are dipped, afterward being baked in the same manner as the ordinary japan

ELECTROCHEMICAL INDUSTRIES

The development of electrochemical industries is a matter of great interest and of grave concern not merely to chemists and engineers but to every inhabitant of this country, for upon these industries may well depend not merely our prosperity but, at no very distant date, our very existence as a nation. The products of these industries are indispensable in almost every branch of our industrial life, and, moreover, during the recent war, it was clearly demonstrated how vitally important are some of the products of electrochemical industry. These products include such essential materials of construction as aluminum, the purer forms of copper, zinc, nickel and lead; the ferro alloys without which we could have no special steels; such essential manufacturing aids as abrasives and refractories; essential chemicals such as the alkali caustics, chlorates, perchlorates, cyanides, chlorine and bleaching powder, phosphorus, etc ; nitrogenous fertilizers; nitrates and other chemical products essential for military purposes.

In the electrochemical industries electric power is used in three general classes of service

(1) For the production of high temperatures in electric furnaces (thermal applications).

(2) For purely mechanical purposes, viz., the driving of various machines, such as pumps, blowers, and mills by means of electric motors

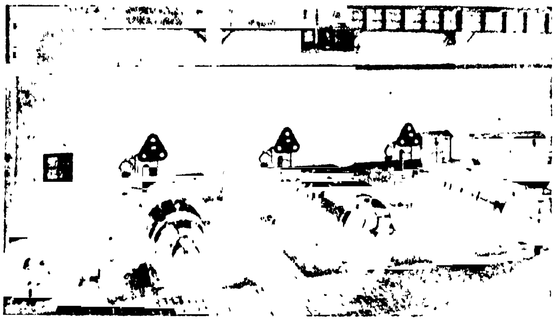
(3) For the production of electrolytic effects.

The electric generating, distributing and controlling equipment for the last of these classes of service—the electrolytic—is described briefly here, the two other classes of service being considered on the pages following.

The electrolytic plants of this country use relatively large quantities of electric power. The lowest power consumptions per ton of product, those involved in the refining of metals by electrolytic transfer through solution from anode to cathode, range from 200 to 400 kw-hr. Nevertheless, by reason of the very large scale on which these operations are conducted, power is consumed in this specific service equivalent to a continuous load approximating 100,000 kw. For the production of metals from solution, using insoluble anodes, the power consumption per ton of product is many times greater, ranging from 2000 to 3000 kw-hr. for copper and nickel, and from 3000 to 4000 kw-hr. for zinc. In spite of the fact that this branch of electrochemical work is of very recent development, it involves an installed load capacity exceeding 75,000 kw. For the production of metals by electrolysis of their fused salts, again using insoluble anodes, the power consumptions per ton of product range from 200 kw-hr. in the case of lead to 25,000 or 30,000 kw-hr. in the case of aluminum. The aluminum thus produced in America in 1918 involved a power consumption equivalent to a continuous load of 100,000 kw. The electrolysis of brine, for the production of caustic and chlorine, and the miscellaneous electrolytic oxidation and reduction operations involve a power consumption which is probably equivalent to a continuous load approaching 60,000 kw.

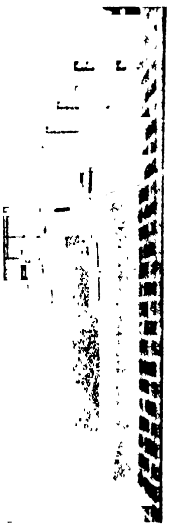
In all of the above mentioned industries, the cost of power is a major item, and often a controlling item in the cost of production. Chemical engineers, not experienced in the design of electrical equipment, may not immediately appreciate the fact that along with their development of process equipment, there has had to be a corresponding development of electrical equipment by electrical engineers, in order that electric power might be available at a cost such that the electrochemical process could be commercially feasible

Throughout this development the General Electric Company has played an important part; its engineers and specialists have studied these industries since their earliest beginnings, and they have collected experience and data which have enabled them to design and construct machinery capable of meeting all of the electrical requirements of the electrochemical plant.



G-E TURBINE GENERATORS SUPPLYING POWER TO ELECTROCHEMICAL PLANT

Generator Installations—Low cost of electric power is essential for the successful commercial development of many electrochemical products A few years ago, water-power was the principal source of cheap electrical energy, but the recent remarkable increase in efficiency of steam-electric generators, particularly steam turbine-driven units, frequently enables the steam plant to successfully compete with the hydro-electric plant



TRANSFORMER INSTALLATION

Steam turbines and electrical equipment for steam, gas, oil engine, or hydro-electric generating stations, and for transmission systems and substations can be furnished complete by the General Electric Company Specific inquiries on any of these subjects are invited by G-E specialists The General Electric Company has manufactured and installed electrical apparatus, which is operating successfully at voltages as high as 165,000 volts and G-E equipment is now being built to operate at 220,000 volts. More than 3,000,000 kv-a capacity of water-wheel type generators; more than 10,000,000 kw. capacity of steam turbine-driven generators, and many millions of kv-a. in transformer capacity have been built by the General Electric Company, and placed in successful operation. Bulletins descriptive of this apparatus will be supplied upon request.

Synchronous Converters—Synchronous converters are extensively used in the electrochemical industry. They can be provided with direct-connected alternating-current boosters, by means of which the direct-current voltage may be varied 15% to 20% in either direction from the average direct-

Continued on Next Page

rrent voltage. They can be supplied for nearly all voltges employed in industrial plants. In small installations rect-current voltages of 250 volts or less are usually emoyed, but in large installations direct-current voltages as gh as 600 volts are used.

Commercial uses of synchronous converters in the electrohemical industries require that they supply current continusly for long periods of time and must be thoroughly reable and of high efficiency The General Electric Company as furnished for each service some of the largest units ever uilt

Standard machines with high current capacity are listed n the table below; also smaller units for converting small mounts of power from alternating to direct current For rther information send for Bulletin 42500

CONVERTERS FOR INDUSTRIAL SERVICE, 250 VOLTS

Freq	Poles	Kw *	R P M	Amps	Approx Shipping Weight Lbs
25	4	550	750	2200	21500
25	4	850	750	3400	30500
25	6	1100	500	4400	43000
25	8	1750	375	7000	72000
25	10	2250	300	9000	92000
60	6	550	1200	2200	16000
60	8	850	900	3400	23000
60	8	1000	900	4000	24000
60	10	1250	720	5000	31500
60	14	1750	514	7000	55000
60	16	2250	450	9000	63000

*Larger converters can be furnished on request

Freq	Amp	Kw	R P M	Volts	Approx Shipping Weight Lbs
60	300	30	1800	125	3000
60	300	30	1800	250	2950
60	600	60	1800	125	3850
60	300	60	1800	250	3750
60	800	90	1200	125	4700
60	600	90	1800	250	4600
60		110	1200		4000
60		165	1200		4250
60		220	1200		5600
60		330	1200		7600

FOUR 6825-KW. G-E SYNCHRONOUS CONVERTERS

Each of these machines supplies 13000 amperes at 525 volts for the electrolytic production of aluminum

Variation of Voltage—In those electrochemical processes requiring a greater range of voltage than can be obtained from the booster type of synchronous converter, and where momentary interruption of the circuit is not objectionable, the transformer may be furnished with various taps for connection to the converter through proper switching equipment There are very few electrolytic or electrochemical processes, however, which require a voltage variation sufficient to warrant the installation of such an equipment.

Motor-Generator Sets—Where large and rapid variations are required without interruption to the circuit, motor-generator sets are preferable to the synchronous converter Also, if disturbances, or great voltage fluctuations are apt to occur in the power supply circuit, the motor generator set is preferable to the synchronous converter.

G-E motor-generator sets can be furnished with or without direct connected exciters, and with either induction or synchronous motors. When equipped with synchronous motors, the motor may be used in power factor correction.

SYNCHRONOUS MOTOR-GENERATOR SETS—60 CYCLES

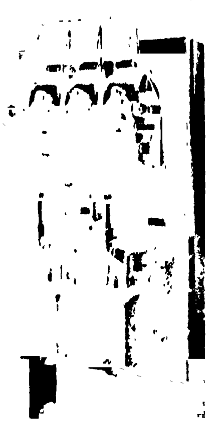
Capacity kw	Speed R P M	Voltages		Shipping Wt. Approx. Lbs.
		d c	a c	
125*	1200	125 volts	2300	8200
Intermediate sizes standard up to 625	514	125	2300	48000
125	1200	250/275	440-550-2300-4000	7800
Intermediate sizes standard up to 1800	500	250/275	2300-4000	88000

*Information on sets of lower capacity furnished on request.

TWO G-E 200-KW. MOTOR-GENERATOR SETS IN NITRATE PLANT

All sets may be arranged for starting from either the direct-current or the alternating-current end (Bulletin 42552A)

Control Equipment--In electrolytic plants employing direct-current circuits of high amperage and low voltage, special and carefully designed control, starting and circuit-breaking equipment is required. The jumping distance of these low voltages is small, and great reliance can be placed on insulation, but such a circuit will feed a great deal of energy into an arc once established Consequently, switches and circuit breakers for use in electrolytic plants should be especially designed and carefully chosen



20,000-AMPERE, D-C , SINGLE-POLE, AUTOMATIC AIR CIRCUIT BREAKER BUILT FOR ALUMINUM COMPANY OF AMERICA

The General Electric Company manufactures a complete line of circuit breakers and switches and remote control equipment suitable for use in electrochemical plants For description of high-current capacity air circuit breakers for this service send for Bulletin 47540

For high-voltage circuits and for alternating current as employed in the operation of plants manufacturing abrasives, graphite, ferro-alloy, calcium carbide, etc , a complete line of G-E overload and remote control equipment is also available

ELECTRO-THERMAL APPLICATIONS

The General Electric Company is constantly developing new types of equipment, necessitated by the rapid advance in the utilization of electric heat in industrial operations. It offers the chemical industry a varied line of electrical heating apparatus, which is being successfully applied in many different processes. Chemical engineers designing installations in which electric heating equipment can be used should avail themselves of accumulated knowledge and experience in this line.

The following are a few of the numerous operations

Continued on Next Page

which have been simplified or improved by the adoption of electric heating with automatic temperature control:

Drying chemicals, salts, pharmaceutical products, molded metals abrasives, dyestuffs, inks, paper and wood and food products

Baking japans, paints, varnishes, cores compounds lacquers and other metal coating

Melting compounds, pitch and wax and heating oils and solutions, melting lead tin solder and babbitt, melting brass copper, aluminum, zinc and non ferrous alloys

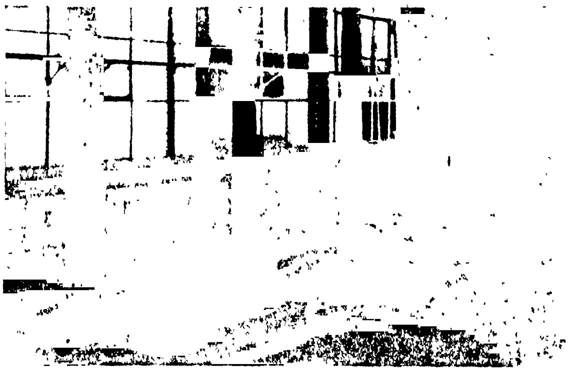
Hardening, drawing, annealing and tempering carbon steels, drawing high speed steels, annealing brass, copper and nickel, annealing glass Firing vitreous enamel

Sherardizing (rust proofing) various metal parts

Arc Furnace Equipment—This Company can supply all electrical equipment needed in connection with the operation and control of any type of electric arc furnace (Bulletin 48710A)

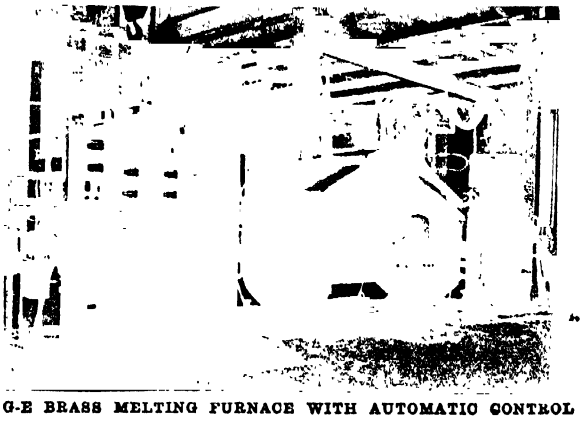
Designers of furnaces for reduction of ores, for production of abrasives, ferro-alloys, steel, electrolysis of fused salts, fused silica products, carbon bisulphide, calcium carbide, fixation of atmospheric nitrogen, and a multitude of other electrothermic developments, will find the Company's experience in this line of value

The design of a proper electric furnace for an industrial chemical operation is a problem in electrical engineering as much as in chemistry or metallurgy The furnace specialists of the General Electric Company will cooperate in the proper design of your furnaces from the electrical engineering point of view, advising as to all the latest improvements in regulating devices, transformers, reactances, motor generators and special cables, and as to the best utilization of the sources of energy at your disposal.



G-E MOTORS AND CONTROL PANEL FOR OPERATING CALCIUM CARBIDE FURNACE ELECTRODES

Electric Melting Furnaces are the most efficient and economical apparatus for melting non-ferrous metals and alloys By means of the G-E electric furnace the highest quality of product can be secured with a minimum loss of volatile alloys. Working conditions are vastly superior to those where fuel-fired furnaces are used This furnace is furnished complete with motor-operated electrode and tilting mechanisms and all electrical accessories, such as transformers, switching and metering equipment, automatic electrode control and pyrometer Electric current may be taken from either a 2 phase or 3-phase line



G-E BRASS MELTING FURNACE WITH AUTOMATIC CONTROL

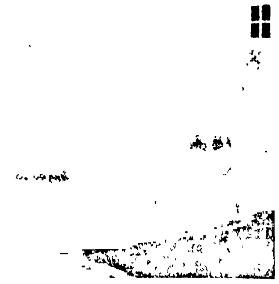
This furnace is suitable for melting practically all non ferrous metals and alloys Its distinctive features and specific advantages of electric melting are listed in Bulletin 6870

The G-E Induction Furnace is essentially a transformer in which the entire energy transferred to the secondary circuit is absorbed therein in the form of heat The secondary circuit consists of a ring of the metal which is to be heated or melted

The principal field of application for this type of furnace is in the refining of steel, cast iron and malleable iron of high quality Other uses are the reclamation of expensive alloy steels, and the melting of ferro-manganese preparatory to alloying steel in the liquid state

The furnace consists essentially of a steel shell, lined with heat insulating and refractory materials to form the hearth surrounding the metal charge The pancake shaped primary coil is located just above the roof, thus removing it from danger of damage by hot metal The furnace is tilted by a motor in the conventional manner.

Additional details will be given upon request.

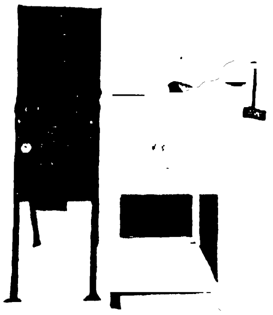


4000-LB. INDUCTION FURNACE

In regular production of special steel this furnace has poured a 1 ton ingot every (approx) 4 hours for 555 consecutive heats before it was necessary to reline it

Electric Heat-Treating Furnaces—The G-E electric muffle furnace meets the demand for a convenient, economical and durable furnace for temperatures up to about 1550°F. For heat-treating carbon steel and experimental purposes. (Bulletin 69702.)

Another type, distinctive in design, is the Semi-Cylindrical Furnace The heating unit, located in the furnace chamber, radiates heat directly to the charge. This produces rapid heating and gives uniform temperature throughout the chamber. This type of heating unit responds more quickly to automatic control and operates at lower temperature for any given temperature in the furnace chamber than any other type—insuring long life.



SEMI-CYLINDRICAL TYPE HEAT-TREATING FURNACE AND CONTROL PANEL

For existing heat-treating furnaces this Company has developed electric heating equipment with automatic temperature control. This includes electric equipment only, furnace structure to be provided by purchaser. Advantages of electrically heated and controlled furnaces are given in Bulletin 69705.

Heat-treating problems should be referred to the industrial heating specialists in the nearest G-E sales office.

Electrically-Heated Oven Equipment—The electrically heated oven is being used in the chemical industries for various drying and baking processes. In one plant three electrically heated tunnel type drying ovens used to dry coils of steel rods, after dipping in an acid bath and coating with lime, have replaced seven ovens heated by natural gas. The electric ovens are brought up to temperature 380°F. in a small fraction of the time required for heating the gas ovens. The drying is done in about one-fourth the time.

Formerly the drying of effervescent salts was done in gas-heated ovens, but the results were not always satisfactory, due to over or under baking, particles of dirt in the salts, and burning, which meant that the entire bake had to be thrown away. With electric heating these difficulties have been overcome.

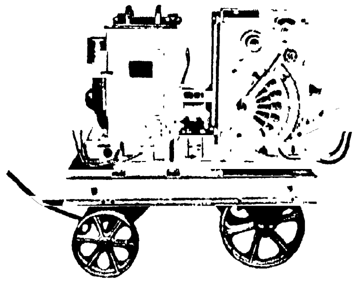
Continued on Next Page

The General Electric Company makes various types of oven heaters and also panels for automatic control, d-c. and a-c., single-phase or 3-phase. The heaters are made in capacities from 1.3 kw. to 12.3 kw., up to 600 volts. These give temperatures up to 950°F. in the oven. (Bulletin 48021A)

ELECTRIC OVEN FOR PROCESSING INSULATED WIRE

Arc Welding Equipment—The art of welding has been known practically since the advent of metal in industry, but autogenous welding has been commercially used only during the last few years. By the latter method, metals are joined by fusion. The General Electric Company has developed four principal types of arc welding equipment designed to meet most every condition where it is possible to join metals by means of the electric arc.

These equipments include motor generator sets, either single or multi-operator types, furnished either portable or stationary. They may be equipped for operation from any standard electrical circuit or the generators may be driven by mechanical power. (Bulletin 48932A)

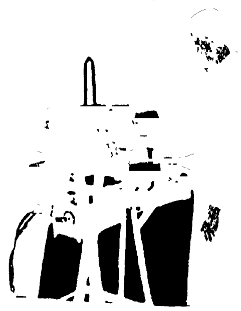


PORTABLE G-E ARC WELDING SET

The G-E automatic welder is a mechanical device to feed the metallic electrode to the work automatically. It is for use on d-c. circuits only. As it can operate continuously for hours at a time and maintain a constant arc length, and therefore constant welding heat, it will make a more uniform, more successful, and more rapid weld than can be accomplished manually.

This machine is particularly adaptable to routine duplicate welding, such as building up worn or undersized shafting, and welding seams of tanks or barrels. (Booklet B-3575)

Welding Accessories—Electrode holders for metallic or carbon electrodes, extra flexible cable for attaching to electrode holders, face masks and head shields may also be supplied on short notice.



G-E ELECTRIC RIVET HEATER

Electric Rivet Heaters—The G-E electric rivet heater will be found useful as part of the repair equipment of a chemical plant in connection with the repair of structural iron work, steel cars and tanks. The use of an electric rivet heater offers many advantages over fuel-fired methods, such as, portability; economy in power used and in successful heating; and the elimination of fire hazard. (Bulletin 69701A)

Electric Sherardizing—Metal to be rendered non-corrosive is sherardized by being electrically heated in the presence of zinc. In order to secure the best results and obtain uniformity as well as durability of coating, it is necessary to have unvarying quality of zinc dust and to maintain a certain correlation between the composition of this dust and the sherardizing temperature. Electric heat is ideal for this purpose as the temperature can be maintained with absolute certainty. Bulletin 48926 describes G-E electric sherardizing machines and gives other points regarding this process.

METAL MELTER

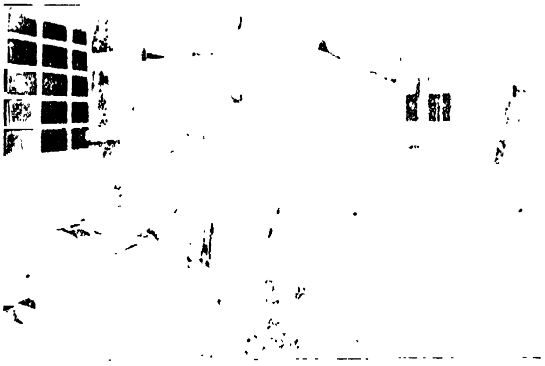
Metal Melting Pots—This Company has developed an electrically heated pot for melting lead, babbitt and similar metals. Automatic regulation is the principal feature—when cold metal is put into the container it is melted quickly by the initial rise of current, after which the current automatically decreases to a value just sufficient to keep the metal molten. (Bulletin 69703.)

Industrial Kettles—The General Electric Company is prepared to furnish heating equipment for kettles and tanks for heating various substances such as oil, paraffin, solutions and compounds, where the purchaser provides the tank and foundation and installs the heating equipment. When requesting prices submit complete requirements.

Cartridge Type Heating Units—For concentrated or localized heating, the cartridge unit provides a more efficient method of heating than gas or steam. The G-E cartridge unit can be furnished for operation on any commercial voltages from 100 to 250 volts. They are now being used for heating various forms of laboratory apparatus, glue pots, soldering irons and small boilers. (Bulletin 69704)

MOTOR DRIVE IN CHEMICAL INDUSTRIES

G-E equipment for mechanical drives in industrial chemical plants includes motors and control of special design to meet the severe conditions imposed upon such machinery. Electric motors must be built with special insulation to withstand the acid and alkaline conditions, especially where there is no ventilating system to take care of waste gases or where location of motor necessarily exposes it to frequent acid splashes or sprays. G-E motors are in use throughout the chemical industries successfully resisting the destructive influences of corroding fumes, or moisture, dust and grit laden air and of extremes of temperature.



G-E MOTOR DRIVING MIXING MACHINES UNDER SEVERE ATMOSPHERIC CONDITIONS

Continuous operation, 24 hours a day, which is often demanded, naturally imposes severe strains on the electrical driving and controlling equipment. The best recommendation for G-E equipment of this class is the fact that it is giving satisfactory service in just such installations.

Chemical plants using motors in locations where the air is charged with inflammable vapors or dust can obtain starting and regulating equipment that will eliminate risk of fire or explosion. Further informa-

Continued on Next Page

tion should be obtained from control specialists, located in G-E sales offices. See page 508.

Air Compressor Drive—Almost every chemical industry requires compressors for air or some other gas. G-E synchronous motors are extensively used for this service and have been selected for some of the largest installations in the world

G-E SYNCHRONOUS MOTORS DRIVING AIR COMPRESSORS

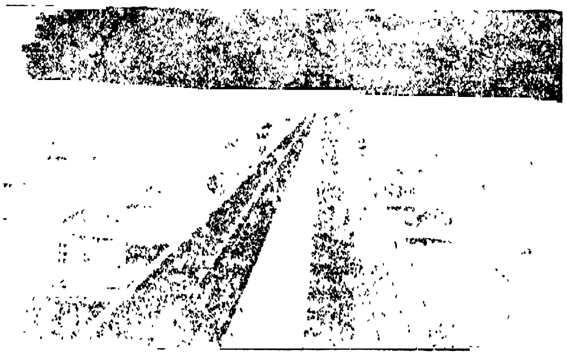
A great power saving can be accomplished in plants where air is used for transferring or agitating liquids and operating blowpipes and furnaces by starting and stopping the compressor electrically. When this is done automatically, dependent upon air pressure, water level, etc, it saves the cost of attendants as well as cost of power when machines can be shut down. G-E pressure governors and switches are available for the control of electric motors in this service

G-E centrifugal compressors or blowers, direct coupled to electric motors or Curtis steam turbines are designed for large volumes and low pressures such as are required for operating furnaces, kilns, dryers and ovens; agitating water and other liquids in all kinds of chemical and oil refining plants, agitation in sewage disposal plants, propelling gases through tower systems and scrubbing apparatus; blowing water gas generators; and ore flotation plants.

The blower or compressor is designed similar to the well-known centrifugal pump but differs from the ordinary fan blower in that it is provided with discharge or diffusion vanes which convert the otherwise lost energy of velocity into pressure energy, resulting into high overall efficiency. The blower is completely housed. Blower and driver being direct-connected means a minimum number of bearings, small floor space required, and elimination of shafting, which is especially undesirable in chemical plants where the atmosphere is generally charged with fumes, moisture and dust (Bulletin 48609.)

G-E MOTOR-DRIVEN CENTRIFUGAL GAS BOOSTERS

Pumping—The industrial chemist recognizes that without solution there would be no chemistry, and usually converts his bulk materials into liquid form in the early stages of the process. Chemical engineering problems, therefore, are largely those of handling liquids efficiently, and the most generally useful machines for this purpose are electrically operated centrifugal rotary and plunger pumps.

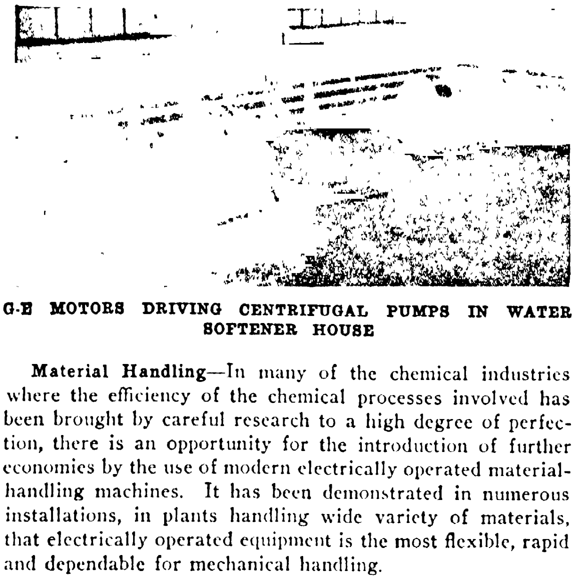


G-E VERTICAL PUMP MOTORS, NEW CORNELIA COPPER CO.

Each motor is protected from the weather by special housing

There are G-E motors for driving pumps of all types. Some of these are specially built to withstand conditions of excessive moisture and can be neglected for long periods, making them suitable for inaccessible locations.

Standard G-E pump motor control apparatus is available which can be operated at will or which will stop pumps at certain tank levels or at predetermined pressures. (Bulletin 61301.)



G-E MOTORS DRIVING CENTRIFUGAL PUMPS IN WATER SOFTENER HOUSE

Material Handling—In many of the chemical industries where the efficiency of the chemical processes involved has been brought by careful research to a high degree of perfection, there is an opportunity for the introduction of further economies by the use of modern electrically operated material-handling machines. It has been demonstrated in numerous installations, in plants handling wide variety of materials, that electrically operated equipment is the most flexible, rapid and dependable for mechanical handling.

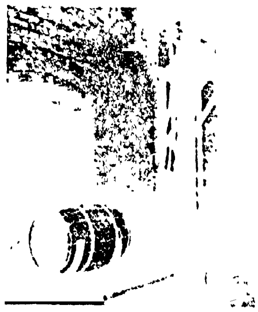
The General Electric Company has developed much special electrical apparatus for driving and controlling these mechanical appliances. Particularly for material handling processes is special control essential. Automatic equipment renders remote control possible and effectively reduces the amount of labor required to operate plants handling large tonnages of material.

The Company's engineers who specialize on problems of this kind are at your disposal to assist in the design of new installations or in the electrification of present equipment. When you submit your material-handling problems to a

Continued on Next Page

manufacturer of this equipment specify "G-E" motors and electric control. This insures you the specialized service of G-E engineers cooperating with the machinery manufacturer for the satisfactory solution of your problem.

G-E MOTOR DRIVING RECLAIMING CONVEYOR



HANDLING BARRELS ELECTRICALLY IN ALUM PLANT

Crushing and Grinding—The diversified crushing and grinding operations in the chemical and metallurgical industries require a versatile line of motors The ball mills shown grind tons of ore per hour. Other installations reduce costly pigments to a fineness necessary for printing inks and high grade enamel, requiring very different motors

Whatever the electrical problem involved in these drives, there is suitable G-E equipment To mention the substances crushed, ground and pulverized by power from G-E motors would be to list almost every material known to these industries.

AN INSTALLATION OF 40 MILLS, EACH DRIVEN BY A G-E MOTOR, INSPIRATION CONSOLIDATED COPPER COMPANY

Small Power Needs—The small manufacturing and testing equipment of the chemical plant and laboratories, requiring a small amount of power, can often be electrified, thus releasing workers for other duties Small electric motors have been successfully applied to small crushing, grinding and mixing machines; centrifuges; small pumps compressors and blowers; stirrers and agitators; and various shop tools.

BATTERY OF SPECIAL MACHINES IN FOOD PRODUCTS PLANT DRIVEN BY 3 H.P. MOTORS

This Company has studied extensively problem of small electric motor applications. G-E engineers have given careful attention to the demands for dependability, quiet running and efficiency and have developed a complete line of motors for driving the light machinery of plant, laboratory and machine shop.

These motors can be obtained in fractional horsepower sizes as small as 1/200 h p , for operation on either alternating or direct current They are designed and built with the same care as the larger G-E motors Submit your small-power problems to the nearest G-E office or send for Bulletins 61509 to 61512

FRACTIONAL HORSEPOWER MOTOR USED WITH THERMOMETER TESTING TANKS

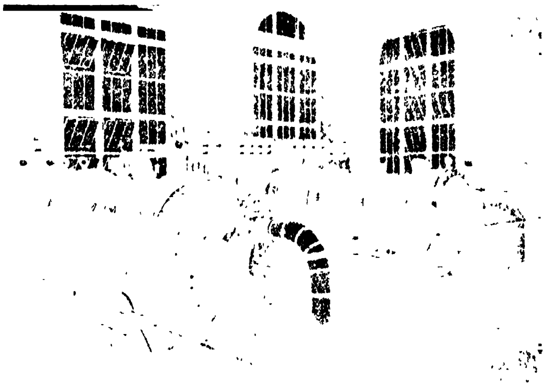
POWER PLANT EQUIPMENT

The General Electric Company is in a position to supply complete electrical equipment for generating electricity from steam, gas, oil or water power. While the Company's facilities enable it to handle the very largest power development propositions, the needs of the manufacturer requiring only a small amount of power are given careful attention, and small chemical plants requiring power for lighting or other purposes, will find complete equipment for their needs.

G-E automatic station control equipment has been developed to meet a wide variety of conditions. It has been successfully applied to the control of synchronous converters, motor generators, synchronous condensers and hydroelectric generators. Automatic stations offer an opportunity for new and important economies More than 100 are now in operation. (Bulletin 40604.)

CURTIS STEAM TURBINES

G-E Curtis Steam Turbines have proved successful not only in large central stations, but in extensive applications in chemical plants, sugar mills, refineries and manufacturing establishments of all kinds.



TWO 500-KW. CURTIS TURBINE GENERATORS

Continued on Next Page

Curtis turbines are built in sizes of 10 kw. to 2000 kw. with d-c. generators, and from 100 kw. upward with a-c. generators. They are arranged for non-condensing or condensing operation with or without superheat. (Bulletins 42010A and 42201A.)

Small Mechanical Drive Turbines—A special form of G-E Curtis steam turbine is adapted to driving centrifugal pumps, fans, blowers and other like apparatus. As in the case of the large G-E Curtis turbines, the best materials and workmanship are employed to insure reliability and efficiency. (Bulletins 42019 and 62015.)

SWITCHBOARDS

The General Electric Company offers a complete line of switchboards for all systems of electrical distribution. Standard unit panels may be ordered direct from switchboard bulletins. Brief information on these types is given in Index Bulletin 47001A.

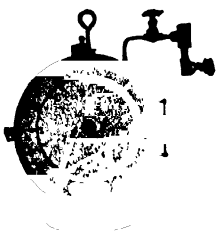
G-E SWITCHBOARD IN POWER HOUSE OF CHEMICAL PLANT

The Company has given much attention to questions of safety in switchboard operation and has developed several types of safety-enclosed switchboards which have proved very successful in service. Information on these designs is given in Bulletins 47100, 67105A and 67110.

All equipment on G-E switchboards—meters and instruments, relays, switches, circuit breakers, etc., is made by a single company, which centralizes responsibility for the operation of the entire board.

FLOW METERS

G-E flow meters provide a means of accurately measuring the total flow of steam, water, oil, air or gas through pipes, furnishing information of great value in an economical management of any manufacturing industry. They are valuable to the chemical plant for measuring the amount of steam generated or used in the power plant, or distributed for heating or for various processes; the amount of water pumped, delivered to boilers, or consumed in plants; the amount of air delivered to furnaces, to a plant department, etc. (Bulletin 46501D.)



G-E FLOW METER

TRANSFORMERS

G-E transformers embody features which have made them preferred by the great central stations of this country. Reliability has always been the first consideration and the many thousands of kv-a. capacity now in service have proved their ability to operate continuously with minimum losses and maximum factor of safety. (Bulletin 45110A.)

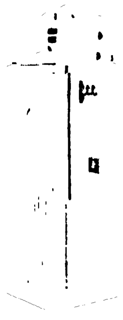
DISTRIBUTION TRANSFORMER

Special transformers for laboratory and experimental purposes are manufactured for any voltage, current or frequency. Tell the nearest G-E office what power sources are available and what you wish to accomplish.

VOLTAGE REGULATORS

G-E generator voltage regulators, a-c. and d-c., are designed for panel, bracket and pedestal mounting. Feeder voltage regulators, hand or motor controlled, for standard single-phase or polyphase circuits, are available for indoor and outdoor service and pole mounting. (Bulletin 45450.)

Small sizes of feeder voltage regulators are also designed for outdoor installation to take care of industrial plants using both lighting and power service.



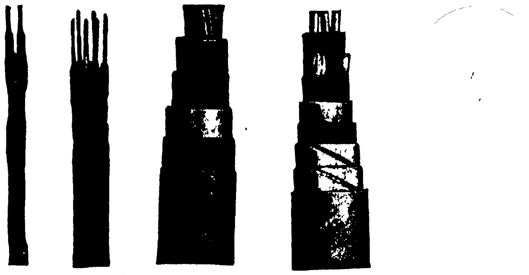
FEEDER VOLTAGE REGULATOR

LIGHTNING ARRESTERS

G-E lightning arresters are available for protection of all kinds of service: aluminum and oxide film types for large a-c. stations, Bulletins 45601B and Y1441; magnetic blowout and d-c. aluminum types for railways, Bulletin 44712; multi-gap types for distribution circuits, Bulletin 45603A; and vacuum tube arresters for signal circuits, Bulletin 45600A.

WIRES AND CABLES

The General Electric Company manufactures insulated wires and cables suitable for use under all conditions pertaining to the distribution of electricity in industrial plants, including suitable forms for use in chemical plants, by-product coke ovens, explosive plants, and elsewhere where excessive moisture, corroding fumes, extremes of temperature, or other severe



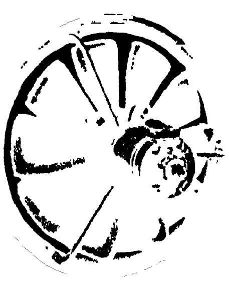
SOME G-E WIRES AND CABLES

Continued on Next Page

conditions may be present. General information on this line is given in Bulletin 49305.

VENTILATING OUTFITS

Self-contained exhaust fans adapted for ventilating laboratories, shops, factories and office buildings, or for use in chemical plants, dye houses, laundries, paper mills and other industries where it is desirable to remove steam, moist air, dust, smoke and odors, or to exhaust noxious gases and fumes which attend certain processes of manufacture. They are usefully employed also to dry chemicals, dyes, drugs, cloth, paper, wool, tobacco, asbestos, bricks, clay, etc. Sizes from 12½ in. to 48 in. with a-c. or d-c. motors. (Bulletin 41810.)



G-E EXHAUST FANS

WIRING SUPPLIES

The line of G-E wiring devices is very complete and includes porcelain and other weather-proof types for outside wiring about the plant. Brief information is given in Bulletin Y 1270, obtainable from G-E Sales Offices. Stocks of these devices are carried by dealers in electrical supplies.

INSULATING MATERIALS

These materials are developed from careful research and made primarily to meet the requirements of G-E products. They are offered to others for general electrical repair work. Varnishes, japans, oils, sealing compounds and paints are described fully in Bulletin 48703. For treated fibers and papers and also asbestos tape and treated cloths see Bulletin 48715.

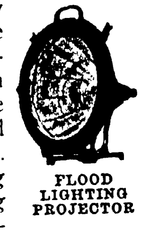
ELECTRICALLY OPERATED VALVES

G-E solenoid operated valves are for remote control liquid or gases under pressure. They can be operated by means of a float switch, thermostat or hand switch. Tanks connected with piping for liquids, steam, compressed air, etc., which are located at various elevations or in inaccessible places, can be arranged for control from a central point by the use of this valve. It is built for connection to 1 in. pipe or smaller.

ELECTRIC VALVE

PLANT LIGHTING

G-E Flood Lighting Projectors throw a beam of light of an enormous candle power. They can be located at any convenient place up to 500 ft. away from the object to be illuminated. They are weather-proof, sturdily constructed and exceedingly economical to maintain. They are useful for such work as loading and unloading ships and cars, or making plant alterations at night, and for protecting property against mob violence and theft. (Bulletin 45850B.)



FLOOD LIGHTING PROJECTOR

G-E Searchlights are also suitable for night work illumination. The Company makes both incandescent and arc lamp types, the latter in sizes from 9 to 80 in. diameter. They are arranged for hand, shaft, rope or electrical control. (Bulletin 43856.)

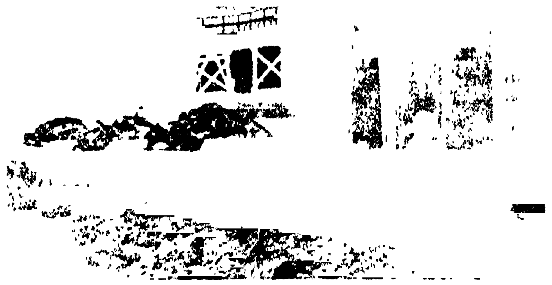
Color Matching Outfits—This equipment satisfies the demand for a low-priced illuminant that will show colors in their true values. It is used in dyeing and finishing plants, dyestuff plants, textile mills, printing ink factories, chemical plants, paper mills, and general testing and research laboratories.

It furnishes practically the same light as comes from a clear north sky, and thus enables many processes to run continuously that formerly could only be run in the daytime under favorable weather conditions.

ELECTRIC INDUSTRIAL HAULAGE

Electric locomotives are admirably adapted for use in the chemical industry, possessing many advantages over steam locomotives, animal haulage and hand trucks. In large plants they will save heavy switching charges for moving freight and tank cars about the yard.

G-E electric industrial locomotives are furnished for standard and narrow gages in standard sizes varying from 4 to 50 or more tons and for operation from trolley, third-rail and storage batteries. Units in service in chemical and various other industries are illustrated in Bulletin 44251.



G-E STORAGE BATTERY LOCOMOTIVE HAULING SALT CAKE

BATTERY CHARGING EQUIPMENT

The General Electric Company is prepared to furnish a complete line of battery charging equipment, adapted not only to all ordinary needs in connection with the operation of storage-battery trucks, locomotives, motor vehicles, storage battery installations in laboratories, etc., but also suitable for all plant and laboratory purposes where a convenient source of direct current is desired, and where the installation of more expensive d-c. generating equipment is not warranted.

Consult the nearest G-E office, stating kind of charging service required.

PRECIPITATION OF FUMES AND SMOKE

The Cottrell electrical precipitation process has found several applications, such as recovering and collecting fumes and dust from gases, recovering tar and oils, and cleaning the air drawn from buildings. The electrical equipment for this process is of very special type. This Company can furnish all of this electrical equipment, described with its application in Bulletin 49137.

GENERAL MACHINE COMPANY

Builders of Chemical Machinery

398 MARKET STREET, NEWARK, N. J.

PRODUCTS

Ball Thrust Bearing "Overhung" Agitators, Mixers or Stirrers for Wood, Iron or other Metallic Tanks.

AGITATORS

We make a specialty of agitating machinery The Ball Thrust Bearing Agitators here described have proved successful and are being used in a great many chemical, pottery, mining and other industrial plants throughout the United States and Canada

They have given users long service and complete satisfaction

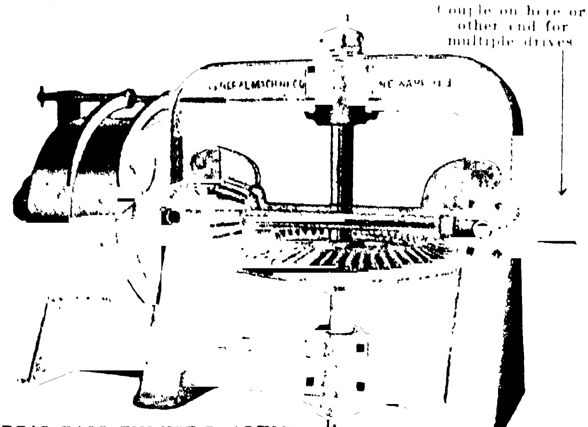
Sizes and Dimensions Our ball thrust bearing agitator is made in four sizes

No. 0 for tanks 2'0" diameter x 2'0" deep or smaller
No. 1 for tanks 4'0" diameter x 4'6" deep or smaller
No. 2 for tanks 8'0" diameter x 6'0" deep or smaller
No. 3 for tanks 12'0" diameter x 8'0" deep or smaller

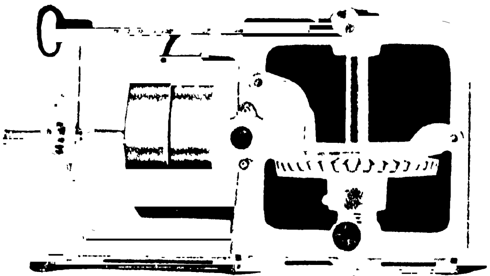
If your requirements are of special dimensions or construction, send us sketches and we will be pleased to give prices and full details.

OVERHUNG AGITATOR DRIVE

The accompanying illustration shows the Ideal Ball Thrust Bearing Overhung Agitator Drive for unit or multiple installations.



IDEAL BALL THRUST BEARING OVERHUNG AGITATOR DRIVE. FOR UNIT OR MULTIPLE INSTALLATIONS.



AGITATOR MECHANISM

Note simple design and rugged construction

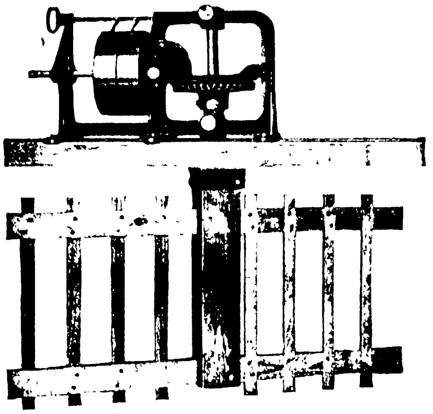
MIXERS

The mixers can be operated collectively or independently, as they are equipped with spiral jaw clutches. They can be equipped with any type of stirrer.

GANGUE MIXERS

STIRRERS

The stirring paddles illustrated herewith are a few of the many designs we are prepared to furnish. They are well designed and ruggedly built.



TYPE "G" STIRRER

TYPE "A" STIRRER

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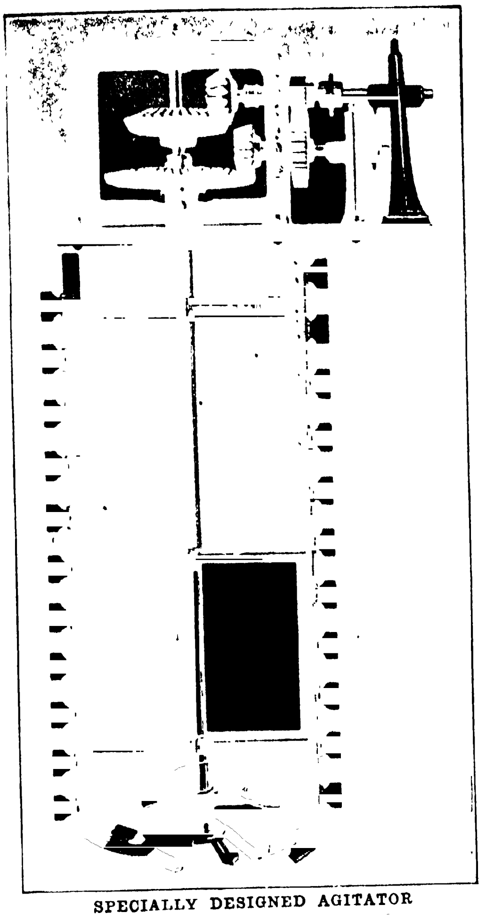
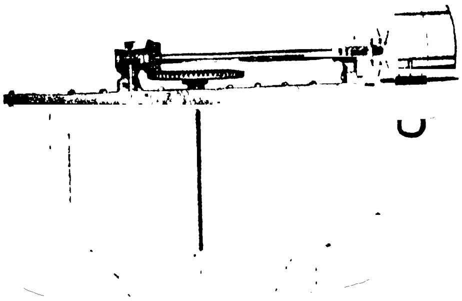
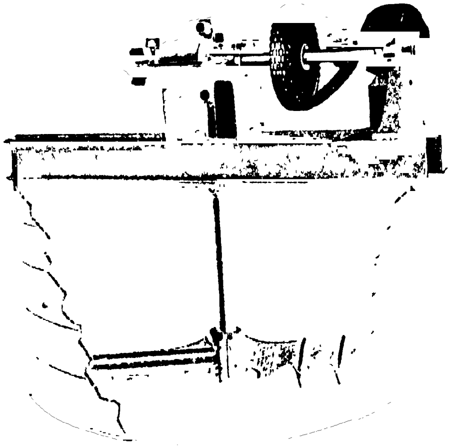


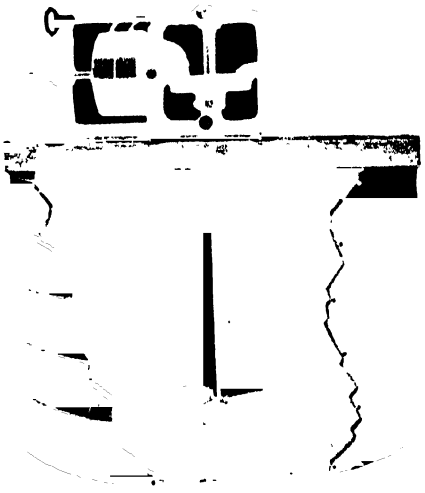
SPECIALLY DESIGNED AGITATOR



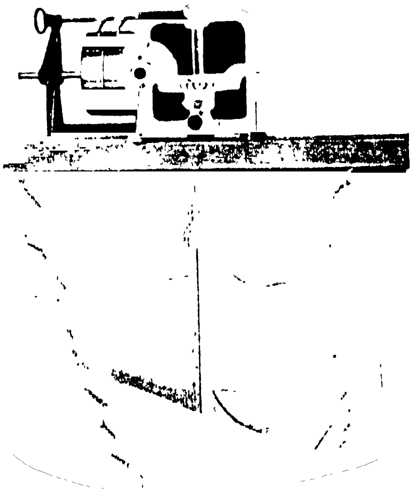
TYPE "R" STIRRER



TYPE "W" STIRRER



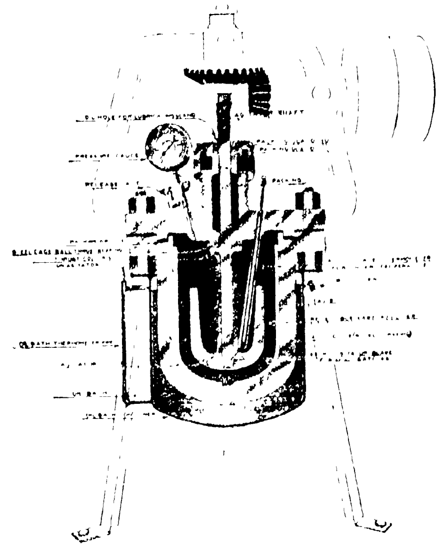
TYPE "T" STIRRER



TYPE "P" STIRRER

AUTOCLAVES

We make a specialty of Laboratory Autoclaves for experimental and semi-commercial work in sizes up to 5 gallons' capacity.



AUTOCLAVE

GENERAL MACHINE COMPANY

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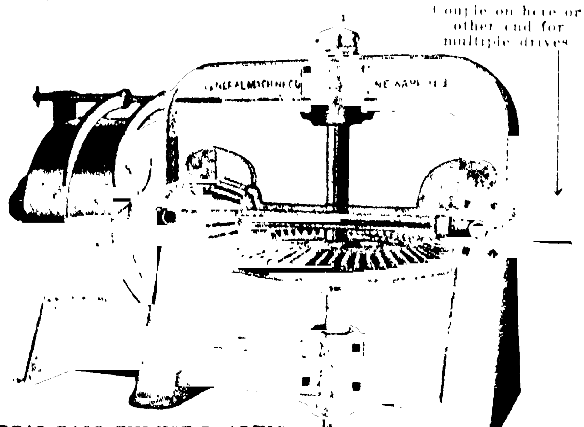

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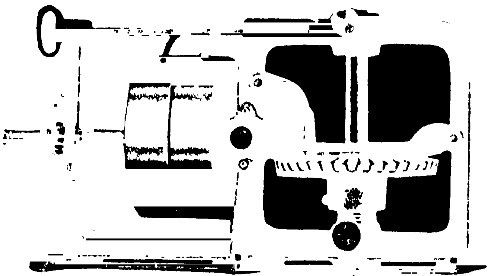

AGITATOR MECHANISM

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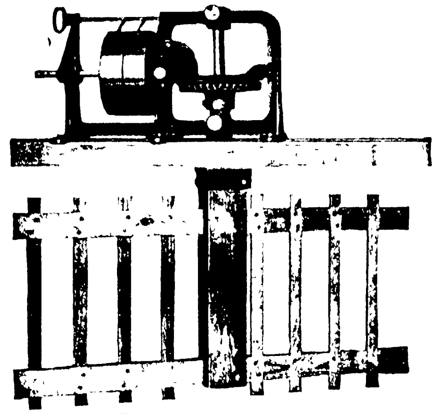
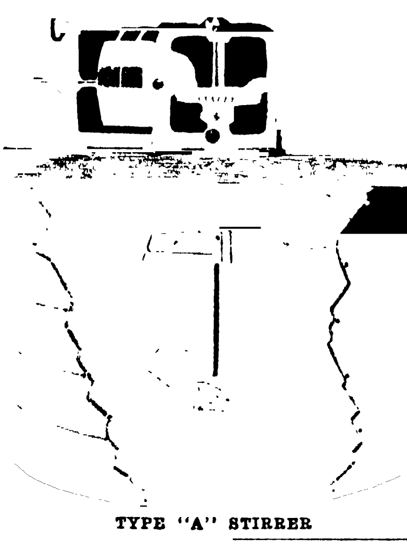


TYPE "G" STIRRER



TYPE "A" STIRRER

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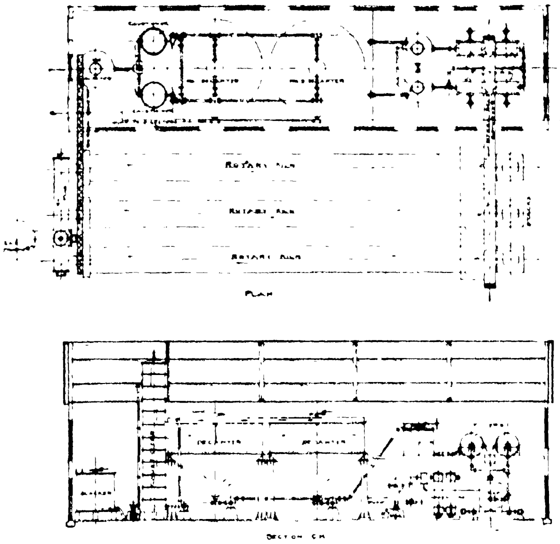
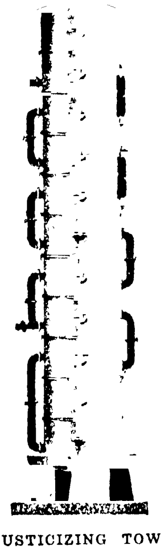


DETAILS OF COMPLETE CAUSTICIZING PLANT

CONTINUOUS CAUSTICIZING WITH LIME RECOVERY AND REUSE

Our apparatus is built for the specific purposes indicated in the above title. It is the work of our consulting engineer, who for nearly twenty-five years was general manager and chief designing engineer of one of the large alkali plants in this country. The apparatus has been in successful operation for some eight years, and is highly efficient, both as regards economy in the use of raw material and saving in labor.

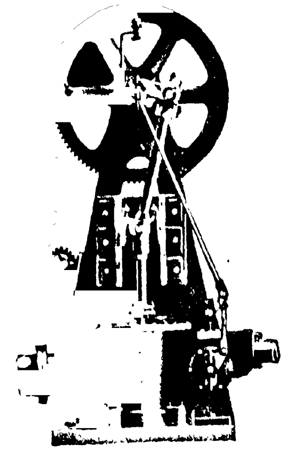


CAUSTICIZING TOWER

The complete plant which we furnish consists, as indicated in the sketch, of a continuous causticizer, decanter, rotary filter, rotary kiln, gas producer, lime slaker and auxiliary apparatus such as vacuum pump, lime and liquor pumps and sludge agitator. All apparatus works continuously The causticizer is heated with exhaust steam and supplied continuously, by means of pumps, with calcium hydrate and sodium carbonate in the proper proportions. The continuous discharge of caustic liquor and lime sludge is delivered by pumps to the decanters, the clean caustic drawn from the top and the mud from the bottom; taken by pump direct to the sludge agitator from whence it flows to the filters, and the dried cake delivered by belt to a rotary kiln, fired with gas, from whence the recovered lime is returned to the slaker to be used again.

With good grade of lime 90% of the sludge can be recovered. The alkali loss is, with careful working, almost nil. All of the apparatus is of heavy construction, and specially designed for the work. The process being continuous the steam consumption is much less than that of the batch process, moreover the process does not require live steam, exhaust at 10 pounds pressure being ample to operate at maximum capacity.

EXHAUSTER



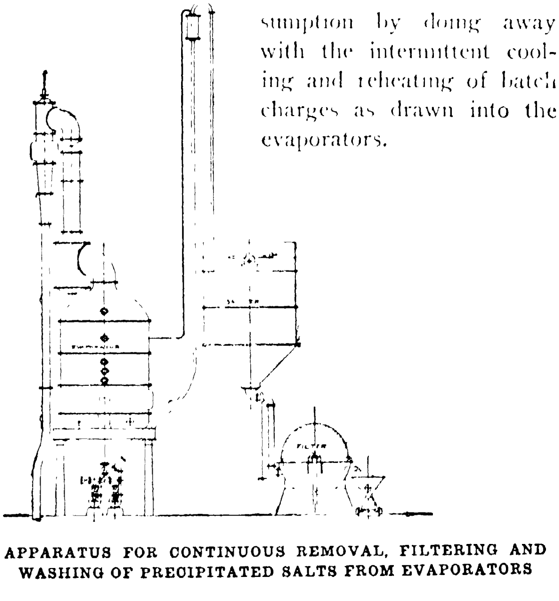
EXHAUSTER

This exhauster is a well designed high efficiency piston displacement machine with extremely low clearances, showing indicator cards closely approximating the ideal for apparatus of this character. The apparatus is simple in construction, of few parts which are easily accessible for oiling and adjustment, and is capable of long periods of continuous day and night operation without stoppage for adjustment.

SALTS APPARATUS

This apparatus, backed by a number of years of successful service, is intended to make what is now generally an intermittent operation, continuous, and in a large sense automatic Moreover the apparatus is of a character requiring no more attention than can be given it by the man in charge of the evaporator. In other words, it can be operated without extra labor.

One of the most important features is that it permits continuous operation of evaporators without periodic drawing off and refilling, consequently it contributes to minimum steam consumption by doing away with the intermittent cooling and reheating of batch charges as drawn into the evaporators.



APPARATUS FOR CONTINUOUS REMOVAL, FILTERING AND WASHING OF PRECIPITATED SALTS FROM EVAPORATORS

GIFFORD-WOOD COMPANY

General Elevating and Conveying Machinery and Ice Tools

OFFICES AND STOCK ROOMS
Boston, 24 Milk St
Chicago, 565 W. Washington Street

MAIN OFFICE AND WORKS
HUDSON, N. Y.

OTHER BRANCHES
New York 50 Church Street
Buffalo Electric Building

PRODUCTS

Elevating and Conveying Machinery of all types for handling bulk, package, bag or barrel goods.

Wagon Loaders and Car Unloaders.

Coal Handling Machinery, and Pockets.

Ice Elevators, Conveyors, Crushers, Carts and Tools.

G-W Pivoted Bucket Carriers.

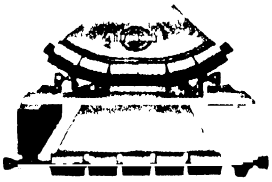
Bagging Machines; Friction Clutches; Hoists.

Screens of all types.

Castings for Chemical Plants.

BELT CONVEYORS

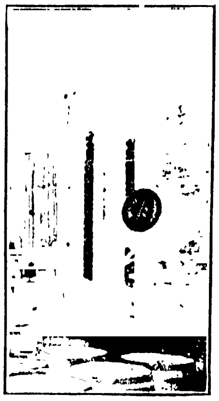
These conveyors are efficient for large capacities over long hauls. Light, therefore require only light supports. Furnished with adjustable troughing rollers. Adaptable on inclines up to 20° from horizontal. Will handle any bulk material.



BELT CONVEYOR

BARREL ELEVATORS

These elevators are made up with projecting arms fastened between two strands of chain running vertically or inclined between sprocket wheels. They take barrels from loading platform and deliver over head wheels to inclined runway or storage room. Also supplied to lower barrels from upper to lower floors.

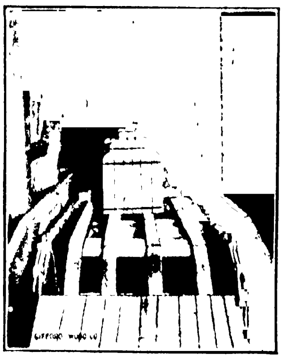


BARREL ELEVATOR

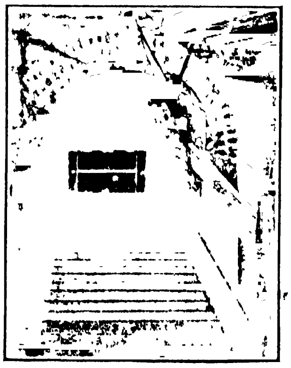
SLAT AND APRON CONVEYORS

The slat type consists of wood bars fastened between two chains at intervals. Used on the horizontal or incline for handling packages along skidways. Often placed at floor level.

The apron type consists of wood slats, with a small space between, each end of which is fastened to a link of conveyor chain. These conveyors are useful in moving case, barrel, sack, or bale goods on level or incline.



SLAT CONVEYOR



APRON CONVEYOR

PIVOTED BUCKET CARRIER

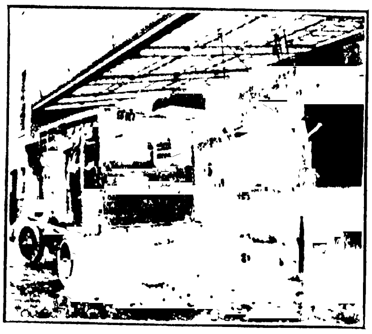
A series of overlapping buckets, pivotally suspended between two endless chains. Constructed to meet extremes of service in plants where large capacities and constant service are required. Material can be loaded and charged at any point.

PIVOTED BUCKET CARRIER. UPPER CONVEYOR RUN OVER BUNKERS

BUCKET ELEVATORS

For handling lumpy or granular materials in bulk from level to level on vertical or sharp inclines bucket elevators are the most economical.

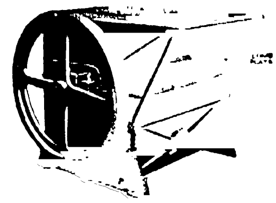
BUCKET ELEVATOR IN ASH PIT



BUCKET ELEVATOR
Handling Crushed Ice at Ice Cream Plant

ICE CRUSHERS

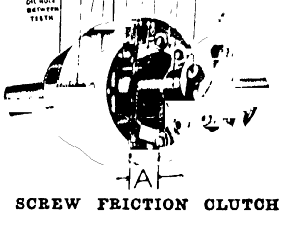
Creasey Ice Breakers are exceedingly efficient for chemical plants and laboratories requiring large amounts of chopped ice. Made in a number of sizes to suit requirements; the size of the cracked ice produced can be varied. Operated by hand or power. Booklet with complete description on request.



ICE BREAKER

FRICTION CLUTCHES

This is a ruggedly constructed clutch. Made in types suitable for low or high speed, also light or heavy duty. Adaptable for use on elevating and conveying machinery, centrifugals, agitators, mixers, etc.



SCREW FRICTION CLUTCH

GLASS SPECIALTY COMPANY

Incorporated 1913

Manufacturers of

Laboratory and Chemical Glassware

235-239 PLANE STREET, NEWARK, N. J.

Cable Address
"GLASPECO"

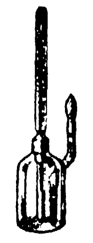
Telephone
MARKET 981

PRODUCTS

- Adapters
- Alundum, crucibles, filters, etc.
- Analytical balances, Chainomatic
- Bacteriological apparatus
- Beakers, glass
- Biological apparatus
- Bulbs
- Burettes, all kinds
- Burners, all kinds
- Condensers, Liebig, bulb and spiral
- Crucibles, porcelain, clay, nickel, etc.
- Cylinders, glass plain, graduated and nessler
- Dishes, Petri
- Drying ovens
- Experimental work to blue print and specifications
- Extraction apparatus—all kinds
- Flasks—glass all kinds
- Filter paper, Whatmans, Pratt Dumas, Munktells and American
- Freas Vacuum Ovens
- Funnels
- Gas Analysis Apparatus
- Glassware, chemical and laboratory
- Glincky's tubes
- Generators
- Hydrometers and jars
- Incubators
- Jars—all kinds
- Laboratory hardware
- Lactometer
- Milk testing apparatus
- Mortars and pestles, glass and porcelain
- McLeod gages
- Nitrogen Determination apparatus
- Oil testing apparatus
- Orsat Manifolds and pipettes
- Porcelain ware, Ohio, Coors and imported
- Pyrex glassware and tubing
- Quartz Ware
- Retorts, glass and metal
- Rubber stoppers and tubing
- Saccharimeters
- Scales and weights
- Silica Ware
- Specific Gravity bottles and balances
- Sterilizers
- Test tubes
- Thermometers and hydrometers
- Tubes, potash, distilling, etc.
- Vacuum apparatus and pumps
- Wash bottles
- Wooden ware for laboratory

NO. 825
BOTTLE, SPECIFIC GRAVITY

With "ground in" centigrade thermometer, divided in 1/5 degree, and stoppered in capillary tube.



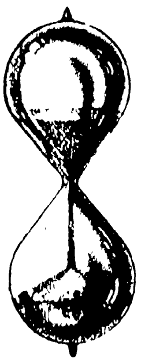
SPECIFIC GRAVITY BOTTLE

SERVICE

In our own Manufacturing Department we give prompt service to those firms desiring special glassware.

NO. 900
SAND GLASSES

Unmounted or mounted in polished wooden frames. Times to periods of from ½ to 30 minutes. Sand runs smooth and uniform.



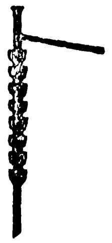
SAND GLASSES

GLASS BLOWING

We are especially equipped to handle orders for Special Glass Parts and Apparatus used in Research, Experimental and Scientific Work in Laboratories and Industrial Plants.

NO. 986
DISTILLING TUBES

With pear shaped bulbs for fractional distillation. We are manufacturing and have in stock all kinds of fractional distilling tubes.



DISTILLING TUBE

GRINDING AND DRILLING

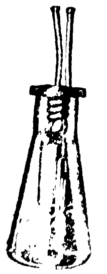
In our Grinding Department we are prepared to do grinding of all kinds including stopcocks, glass joints and drilling holes through glass.

ENGRAVING AND GRADUATING

Engraving, Etching, Graduating and Calibrating done accurately and well by experts. All our work checked against Bureau of Standards and can be certified at regular additional cost.

NO. 2800
EXTRACTION APPARATUS

For rubber analysis of special dimensions, as recommended by the Joint Rubber Insulation Committee.



EXTRACTION APPARATUS

REPAIR WORK

Do not scrap your broken apparatus. Bring them to the "Glass Doctor." All kinds of repairs done promptly.

GLANDER AND COMPANY

Sales Engineers

800 BROAD STREET, NEWARK, N. J.

Cable Address
"CHASTECH" N Y

PRODUCTS

- Tanks
- Dryers
- Stills
- Mixers
- Pumps
- Cranes
- Motors
- Engines
- Boilers
- Heaters
- Turbines
- Condensers
- Hydraulic Presses
- Glass Enameled Tanks
- Refrigerating Equipment
- Kettles
- Grinders
- Reducers
- Nitrators
- Digesters
- Autoclaves
- Ball Mills
- Evaporators
- Vacuum Pumps
- Centrifugals
- Sulphonators
- Vacuum Pans
- Filter Presses
- Alcohol Distillation and Rectification Apparatus

SERVICE

New Equipment—This organization specializes in equipment for the chemical industry. We are prepared to furnish engineering advice and contract for the erection of complete plants.

We have facilities for the manufacture of chemical apparatus in various metals, workmanship first-class, and materials the best obtainable.

We are prepared to quote upon equipment following customers' designs and specifications, or our own designs, which follow the latest approved practise.

The illustrations are of equipment actually built and now in use, and show the varied types of work we are prepared to handle.

Used Equipment We purchase and dispose of chemical process, refrigerating and power equipment.

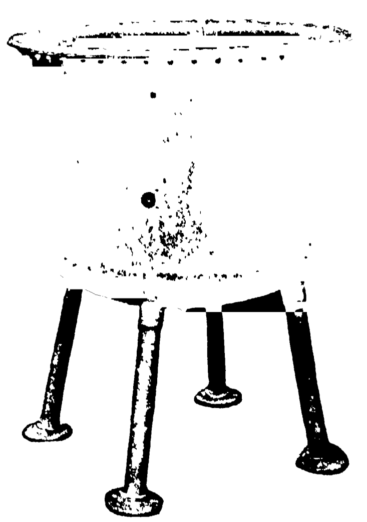
Only such equipment as passes the rigid physical inspection imposed by our engineers is offered and sold, and we submit complete reports to our clients, based upon such inspection.

WARRANTY

All equipment is warranted in first-class physical and operating condition, and to efficiently perform the service for which it was manufactured.

JACKETED KETTLE

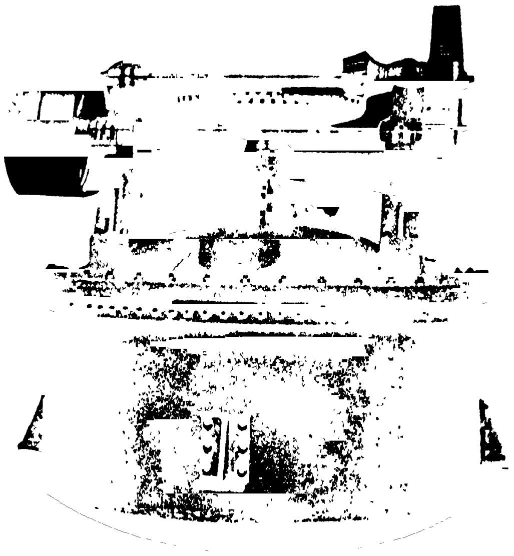
Open top, Jacketed Kettle, seamless welded or riveted construction, shapes and capacities to suit customers' requirements.



JACKETED KETTLE

MIXING KETTLE

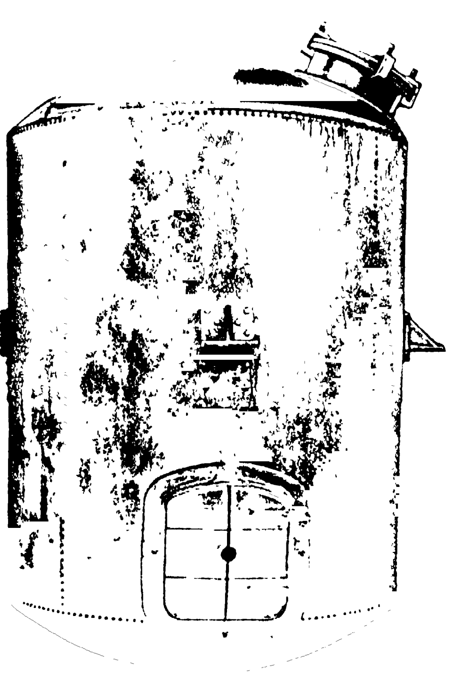
Jacketed Mixing Kettle, with autogenous inside and outside shell seams, cast-iron bolted cover. Heavy stirring device, double reduction gear drive. For high pressure the inside shell is made of forge hammer weld construction.



JACKETED MIXING KETTLE

OIL FILTER

Rolled steel, special Oil Filter, built in sizes and with openings to meet customers' requirements.

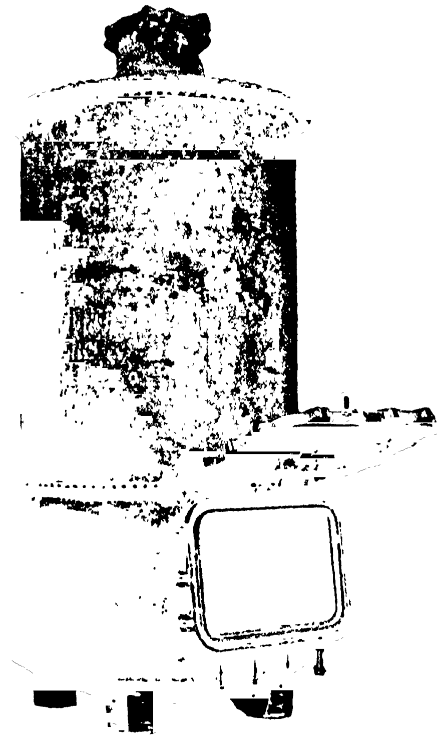


OIL FILTER

Continued on Next Page

VERTICAL EXTRACTOR

Rolled steel, 7 ft. diameter, 16 ft. high. The same design is built in many sizes and of any metal desired to suit liquors handled.



VERTICAL EXTRACTOR

ATMOSPHERIC DRUM DRYER

Rolled steel Drums, welded and finished. Also built with cast-iron or cast-steel drum. Sturdy in design, light in weight, economical in maintenance.

For cooling, solidifying greases, fats, etc., the drum is fitted with brine cooling. This equipment is also built for vacuum operation.

EXTRACTOR

Rolled steel, 6 ft. diameter, 15 ft. high, jacketed throughout. Designed especially for the quick discharge of products after extraction of the solvent. Built in many sizes to meet customers' requirements.

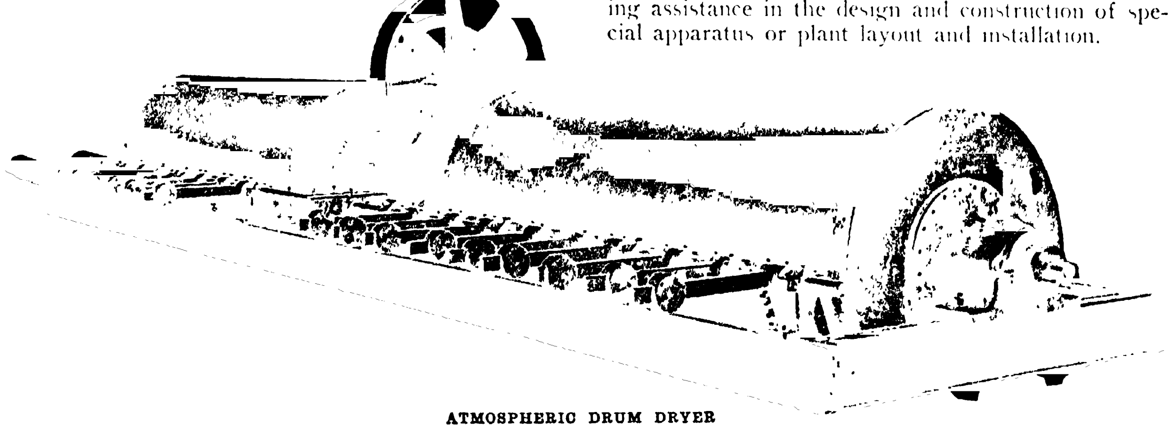
VERTICAL EXTRACTOR

INQUIRIES SOLICITED

We are always glad to send drawings and description of our apparatus to Operating Engineers of manufacturing plants, who are interested in more efficient production equipment. We will be glad to cooperate with these men in designing and building special chemical apparatus.

EXPERIENCE

The members of our staff have individually had several years' experience in chemical industries and other engineering fields, which is always at the disposal of present and prospective customers, by rendering assistance in the design and construction of special apparatus or plant layout and installation.



ATMOSPHERIC DRUM DRYER

GLENS FALLS MACHINE WORKS

Manufacturers of Rotary Sulphur Burners
GLENS FALLS, N. Y.

PRODUCTS

Rotary Sulphur Burners for the conversion of Sulphur to Sulphur Dioxide.

Pulp and Paper Mill Machinery: A. D. Wood Pulp Washers, Slushers, Water Filters, Save Alls; Standard Deckers; Standard Wood Pulp Grinders; Moore Rotary Screens; Rotary Pumps; Rogers Wet Machines for automatically converting chemical pulp into sheets 48% dry; Standard Wet Machines; Wells Undulating Knot and Sliver Screens.

BURNING SULPHUR

Industrial operations requiring the burning of sulphur for acid manufacture, or for SO_2 gas, depend for their economy on the thorough burning of the sulphur, with consequent elimination of sublimation of unburned sulphur, and the proper control of the combustion in order to prevent conversion to SO_3.

The Rotary Sulphur Burner is recognized as the standard machine for the perfect burning of sulphur to SO_2

ADVANTAGES

Among the advantages derived from the installation of the Rotary Sulphur Burner are,

- Exceedingly Low Labor Costs
- Ease of temperature control
- Uniform strength of Gas
- High Concentration
- Clean, White Acid
- Greater Production
- Maximum Yields
- Minimum Repairs

ONE OF OUR MANY IDEAL INSTALLATIONS

MECHANICAL DETAILS

The machine consists of a revolving cylinder, the shell being of plate steel The cone-shaped heads are riveted to the ends of this shell

Combustion Chamber--The Combustion Chamber is either a cast-iron box, or a closed circular steel tank, lined with fire-brick

Our patented anti-sublimation sleeve set between the conical head and combustion chamber insures proper amount of air for perfect combustion

Drive Our regular drive consists of a heavy horizontal shaft supported by cast-iron floor stands, equipped with a pair of bevel driving gears and friction clutch, and with pulley sprocket or gear for driving In addition to this, we are prepared to furnish our spur reducing gear motor drive consisting of cut spur gears, bearing stands, shafting and motor base plate, making entire drive self contained, or our worm reducing gear drive consisting of worm gears running in oil, jack shaft, floor-stands, sprockets, driving chain and flexible coupling for attaching to motor

Mechanical Feed Our mechanical feed consists of a cast-iron worm running in a large hopper, capacity of which is 500 pounds sulphur The worm is operated by a chain drive, and a number of various sized sprockets are furnished for regulating speed of worm, that a constant feed may be maintained

Each burner is also equipped with an additional combination door and adjustable damper, which can be used in place of mechanical feed if desired, or in connection with our steam sulphur melting equipment, which we are prepared to furnish for any capacity

Foundation—No special foundation is necessary. The machine can be placed on an ordinary concrete floor.

SIZES

The following table will give a combination to suit any requirement.

Capacity ratings for this machine when connected to a chamber set are derived from actual practise with draft of ¼" to ⅜" water as shown on draft gauge connected to exit pipe near combustion chamber. For contact plants, ratings are with draft of ¾" to 1" water

Our "Regular" machines consist of burner proper with trunnion shafts and bases, either stand and pulley or friction drive, regular cast iron combustion chamber and mechanical feed.

All combustion chambers of the standard 36" burner size and larger are equipped with our patented anti-sublimation sleeve and expansion flange joint for gas exit pipe.

For extra high consumption of sulphur, where strong draft can be used, we recommend our steel tank combustion chamber, fire brick lined.

Mechanical feed is of our improved patented type and guaranteed not to plug.

For use in connection with chamber sulphuric acid plants, where much conservation of heat is desirable for high concentration, we are in a position to submit several designs of fire brick constructed combustion chambers, also combination fire brick combustion chambers and niter ovens. These are designed to suit the specific requirements of our clients. We will gladly submit plans upon request.

TABLE OF SIZES AND COMBINATIONS WITH RATED CAPACITIES

	Capacity for Chambers		Capacity for Contact		Tons of Pulp	Drive, etc
Size	Hour	Day	Hour	Day	Day	Boxed for Export
14"x30"	10 lb	240	20 lb	480		Regular, with spur reducing gear
20"x4'	35 lb	840	50 lb	1200		Regular
" "	"	"	"	"		½ h p motor and reducing gear
20"x8'	65 lb	1560	100 lb	2400		Regular
" "	"	"	"	"		½ h p motor and reducing gear
30"x8'	130 lb	3120	200 lb	4800	15	Regular C I Chamber
" "	"	"	"	"		36" size combustion chamber
" "	"	"	"	"		6'x10' Steel Tank Chamber
36"x8'	250 lb	6000	350 lb	8400	25	Regular C I Chamber
" "	"	"	"	"		48" size Combustion Chamber
" "	"	"	"	"		6'x10' Steel Tank Chamber
48"x8'	350 lb	8400	450 lb	10800	35	Regular C I Chamber
" "	"	"	"	"		6'x10' Steel Tank Chamber
" "	"	"	"	"		7' 6"x10' Steel Tank Chamber
48"x10'	400 lb	9600	550 lb	13200	40	Regular C I Chamber
" "	"	"	"	"		7' 6"x10' Steel Tank Chamber
48"x16'	700 lb	16800	900 lb	21600	65	Regular C I Chamber
" "	"	"	"	"		7' 6"x10' Steel Tank Chamber
48"x20'	900 lb	21600	1200 lb	28800	85	Regular C I Chamber
" "	"	"	"	"		7' 6"x10' Steel Tank Chamber

H. P. Requirements of Rotary Sulphur Burners

14"x30" machine requires ¼ H P
20"x 4' " " ½ H P
20"x 8' " " ½ H P
30"x 8' " " 1 H. P.
36"x 8' " " 1 H P.
48"x 8' " " 1 H P.
48"x10' " " 2 H. P.
48"x14' " " 2 H P
48"x16' " " 2 H P
48"x20' " " 2 H P

3 H P. is sufficient for operating two machines of any of the sizes including 48"x8' size and larger.

GOETZE GASKET & PACKING COMPANY

Chemical Service Dept.
NEW BRUNSWICK, N. J.

PRODUCTS

Goetze Gaskets for chemical service.

Goetze No. 2 Corrugated Metal and Asbestos.

Goetze No. 1 Corrugated Metal.

Goetze Devo Corrugated Metal with Asbestos and Cement.

Goetze Triumph Metal Asbestos.

The above made of Aluminum, Brass, Bronze, Copper, Iron, Lead, or Lead Composition, Monel Metal, Nickel, Silver, Steel, Zinc, etc.

Goetze Valve Gaskets made of a Copper Shell with asbestos filling. Monel Metal or Nickel with filling. Lead or Composition Metal corrugated or solid for chemical service.

"Goetzerit" Sheet Packing.

Goetze Asbestos Chemical Proof Packing.

Goetze Metallic Packings for valve stems, engine, pump and chemical service.

SIZES AND USE

Goetze Gaskets are made in any size desired from ¼ inch to 25 feet in diameter and larger, in various metals and combinations, for flange and pipe line joints, stills, evaporators, digestors, autoclaves.

SERVICE

Goetze products are made to conform with the various industrial requirements. Those which we manufacture for the chemical industry as well as for power plant service are made of certain metals and combinations to meet the conditions. Goetze Gaskets have stood the test for years. They have made good under conditions where nothing else would hold.

Alkalis
Acid or acidulous conditions
Air, ammonia or refrigerating service
Alcohol and by-products
Benzol and toluol
Fumes and gases
Chemical service in general
Coke oven plants
Distilleries
Economizers joints
Oil conditions, oil refining (hot or cold)
Pumping service
Boiler service
Stationary and marine
Condensed water lines
Cylinder heads
Diesel engines
Flanged joints
Handholes
Heaters
Locomotives
Manholes
Oil engines
Pumps
Steam chests
Steam hammers
Steam shovels
Steam traps
Steam and gas engines
Submarines
Superheaters
Tractors
Unions
Valve bonnets
Water tube boilers, etc

GOETZE NO. 2 ELASTIC

Made from heavy copper, steel, monel metal and various other metals deeply and uniformly corrugated and filled with closely twisted asbestos cord, it forms a cushion which takes care of contraction and expansion in pipe lines. The "Comeback" in this gasket is so great that even where the pipe is out of alignment and the flange surfaces are not equidistant the gasket will hold the joint firmly tight and will give excellent service when used again.

GOETZE VALVE GASKETS OR DISCS

This is a copper valve gasket with an inlay of asbestos, forming a cushion on which the seats of valves of Jenkins and Crane types may close without injury and with the certainty of making a tight valve seat.

While closing tightly, this gasket will not crumble, deteriorate, or injure the valve seat.

They are also made of monel metal or nickel with asbestos filling, as well as Goetze Corrugated Composition Solid Metal type for acid and chemical service. Made in different sizes from ¼ inch up to 12 inch valve.

GOETZERIT SHEET AND GASKETS

A red asbestos sheet packing, especially recommended for high pressure superheated and saturated steam, air, ammonia, oil and chemical service, etc.

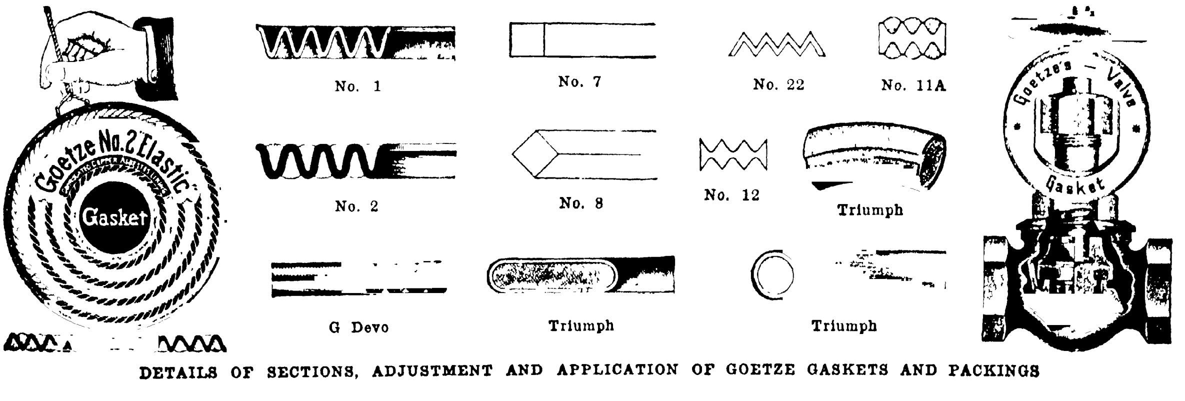
Made of pure, prime asbestos fiber, compressed under exceedingly high pressure, it is chemically treated to render it proof against the destructive action of high pressure, temperature and chemical service.

Goetzerit does not squeeze out into the pipe openings.

Furnished in sheets about 50 inches square, in thicknesses of 1/32", 1/16" and ⅛".

GOETZE CHEMICAL PROOF GASKETS OR PACKINGS

The Goetze Chemical Proof Gaskets or Packings are made of a suitable metal with asbestos or composition filling to make them impervious to the action of chemicals. They are designed to meet every need in the machinery and chemical field to-day.



DETAILS OF SECTIONS, ADJUSTMENT AND APPLICATION OF GOETZE GASKETS AND PACKINGS

THE GOULDS MANUFACTURING COMPANY

Triplex, Centrifugal, Deep Well, Rotary and Hand Pumps

MAIN OFFICE AND WORKS

SENECA FALLS, N. Y.

BRANCH OFFICES

New York, 16 Murray St   Philadelphia, 111 North Third St   Chicago, 12 14 South Clinton St
Boston 58 Pearl St   Detroit 804 Dime Bank Bldg   Pittsburgh 636 Henry W. Oliver Bldg
Atlanta Citizens & Southern Bank Bldg   Houston 1001 Carter Bldg

SALES AGENCIES IN ALL PRINCIPAL CITIES

PRODUCTS:

Power Pumps Single Cylinder Duplex and Triplex Single- and Double-Acting.

Centrifugal Pumps Single-Stage and Multi-Stage – Horizontal and Vertical.

Vacuum Pumps; Deep Well Pumps; Rotary Pumps; Diaphragm Pumps; Hydraulic Pressure Pumps; Hand Pumps and Pumps for all Special Services such as:

Acid Pumps
Ammonia Pumps
Brine Pumps
Dyehouse Pumps
Fire Pumps
Laboratory Pumps
Molasses Pumps
Oil Pumps
Sewage Pumps
Slush Pumps
Stuff Pumps
Sugar House Pumps
Tank Pumps
Tar Pumps

POWER:

Our pumps can be furnished for belt, chain, gear or direct drive from engines, turbines, motors, or any other type of driver.

Our line also includes hand pumps of every kind for every service.

SERVICE:

We are familiar with the great diversity in requirements for pumps in the chemical industries, and consequently our whole selling plan is based on our consulting service to our prospective customers. Tell us your pumping conditions and when these are given we will recommend the best pump for your particular requirements and guarantee it to do the work for which we recommend it.

SPECIAL PUMPS FOR CHEMICAL PURPOSES:

The parts of Goulds Pumps coming in contact with the liquid being handled will be supplied of a material capable of successfully resisting the liquid, as suggested by our experience.

SINGLE-ACTING TRIPLEX PLUNGER PUMPS:

Fig. 1696

These pumps are suitable for general water supply, boiler feeding, mine pumping, etc.

They are suitable for use at pressures ranging from 100 lbs. or 231 ft. elevation to 300 lbs. or 693 ft. elevation.

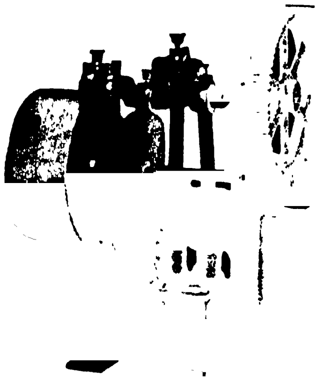
These pumps are very strongly built, exceedingly simple and reliable in operation and can be furnished for any standard form of drive.

For handling viscous liquids these pumps can be furnished with ball valves in all sizes up to and including the 7" x 8"

FIGURE 1696

Single-Acting Triplex Plunger Pump

Capacities ranging from 120 gallons to 21,000 gallons per hour



Type of the 3½"x4" and smaller sizes

DATA, SINGLE-ACTING TRIPLEX PLUNGER PUMP

Gals Displacement per Min	Size Pump		Disp 1 Rev of Crank Shaft Gals	Rev per Min	Approx H P at Catalog Rating	Size Pipe		Tight and Loose Pulleys Inches
	Diam Ins	Stroke Ins				Suc Ins	Dis Ins	
2	1¼	2	0 031	67	.35	¾	¾	12 x 1½
4	1¾	2½	0 078	52	64	1	1	12 x 2½
6	2	3	0 122	50	96	1¼	1¼	12 x 2½
6	1¾	2½	0 078	77	89	1	1	12 x 2½
9	2	3	0 122	75	1 33	1¼	1¼	12 x 2½
12	2½	4	0 255	48	1 71	1½	1½	15 x 3
18	2½	4	0 255	71	2 46	1½	1½	15 x 3
18	3	4	0 367	50	2 29	1½	1½	15 x 3
25	3	4	0 367	70	3 07	1½	1½	15 x 3
25	3½	4	0 501	50	3 07	2	2	15 x 3
40	4	6	0 978	42	4 60	2	2	20 x 3
50	4	6	0 978	52	5 65	2	2	20 x 3
60	4	6	0 978	62	6 72	2	2	20 x 3
100	5	8	2 041	50	10 60	3	3	30 x 5
125	5	8	2 041	62	13 00	3	3	30 x 5
125	6	8	2 938	43	13 20	4	4	30 x 6
150	6	8	2 938	52	15 80	4	4	30 x 6
175	6	8	2 938	60	18 30	4	4	30 x 6
175	7	8	4 000	44	19 00	4	4	36 x 6
200	7	8	4 000	50	21 30	4	4	36 x 6
250	7	8	4 000	63	26 00	4	4	36 x 6
250	7	10	5 000	50	26 60	5	5	36 x 6
300	7	10	5 000	60	31 30	5	5	36 x 6
300	8	10	6 520	46	32 00	5	5	42 x 6
350	8	10	6 520	54	36 50	5	5	42 x 6

Ratings Based on Pumping Cold Water
For high suction lifts, select pumps to run at slow speeds.

CONSTRUCTION:

Frame and Cylinders—Close grained iron cast in one piece with crosshead guides and cylinders, forming exceptionally rigid construction and accurate alignment of all working parts.

Crank Shaft—High carbon open hearth steel, accurately machined to gauge.

Bearings—Crank shaft and pinion shaft bearings are of babbitt metal

Gearing—Gear and pinion charcoal iron, machine cut from the solid. A guard covers the pinion and adjacent teeth of the gear. Gear ratio 5 to 1

Crossheads—Sizes 4 x 6 in and larger, fitted with adjustable shoes which run in bored guides. Sizes 3½ x 4 in and smaller; the crossheads are cylindrical in form, and run in bored guides.

Connecting Rods—Sizes 4 x 6 in and larger, strap head and wedge adjustment with bronze boxes at crank end and bronze bushings at crosshead end. Sizes 3½ x 4 in and smaller have adjustable boxes babbitted at crank end and bronze bushings at crosshead end.

Continued on Next Page

Plungers—Sizes 2½ x 4 in and larger are fitted with hard cast iron plungers. Sizes 2 x 3 in and smaller have bronze plungers accurately machined and ground true and smooth

Glands—Sizes 2½ x 4 in and larger have iron glands. Sizes 2 x 3 in and smaller have bronze glands.

Base and Valve Boxes -Charcoal iron, in one casting, of liberal proportion, affording large valve area.

Valves -3 x 4 in. and smaller bronze valves. 3½ x 4 in and larger --for cold water, rubber discs on bronze grid seats with cylindrically wound springs. For hot water we recommend the grid seat valve with special composition disc 3½ x 4 in and larger furnished with metal valve when ordered, at extra price

Air Chamber—Supplied with pump. Vacuum chamber to order

Special Construction—Phosphor Bronze Plungers, Lined Cylinders and Glands, Cloth Pinion, etc., to order

DOUBLE-ACTING TRIPLEX PLUNGER PUMPS:

Fig. 1590

These pumps have nearly twice the displacement of a Single-Acting Triplex Pump of the same diameter and stroke. They are designed for 150 lbs. working pressure or 350 ft. elevation.

They are suitable for general water supply, pulp grinders, and other duties where large capacity is required.

In design, materials and workmanship, the pump is of the highest grade and can be furnished for any type of drive.

Fig. 1590
Double-Acting Triplex Plunger Pumps

Frame—Sizes 10 x 12 in. and smaller consist of two standards, held in alignment by center guide bolted between them. The standards are bolted to base, forming a rigid support for the working parts In sizes 11 x 14 in. and larger, the standards are held together by center crosshead guide and cylinder base bolted between them.

Crank Shaft--High carbon open hearth steel, accurately machined to gauge, and fitted with crank discs at the ends of the crank shaft

Bearings--Crank shaft bearings are phosphor bronze, the pinion shaft bearings of babbitt metal.

Gearing--Charcoal iron, machine cut from the solid. Pinion forged steel. Gear guard covers the pinion and adjacent teeth of the gear

Crossheads—Fitted with adjustable bronze shoes which run in bored guides

Connecting Rods—Forged steel, fitted at each end with adjustable bronze boxes, marine type.

Cylinders—Separate charcoal iron castings bolted to base, with bronze linings bolted in, easily removable.

Pistons—Iron with followers and fitted with fibrous packing.

Piston Rods—Best quality high carbon steel.

Stuffing Boxes--Bronze on sizes up to and including 10 x 12 inch Larger sizes bronze fitted. Fibrous packing.

Glands—Bronze, and of easy access for adjustment

Valve Boxes—Separate charcoal iron castings, each containing a set of suction and discharge valves.

Valves—Rubber discs on bronze grid seats with cylindrically wound springs. Metal valves, as ordered at extra price according to style furnished.

Pipe Connections—At either end of Pump, front or back.

Special Construction—Phosphor Bronze Pistons, Tobin Bronze Piston Rods, etc., to order.

Gals Displacement per Min	For Working Pressure	PISTONS		Displacement per Rev of Crank Shaft	Rev per Min	H P at Catalog Rating	SIZES OF PIPE		Geared Approx	Single Pulley for Double Belt
		Diam Ins	Stroke Ins				Suc Ins	Dis Ins		
600	150 lbs	8	12	15 25 gals	40	62 4	8	7	5 6 to 1	Special in each case to suit size and speed of dr.
775	150 "	9	12	19 42 "	40	80 5	8	7	5 6 to 1	
950	150 "	10	12	23 88 "	40	98 6	10	8	5 6 to 1	
1275	150 "	11	14	33 75 "	38	132 7	12	10	5 to 1	
1525	150 "	12	14	40 30 "	38	158 6	12	10	5 to 1	

Ratings Based on Pumping Cold Water.

ROTARY POWER PUMPS:

Fig. 1350

These pumps can be adapted to almost any service within the limits of their capacity and pressure and are especially efficient where the service is intermittent. However, they have been found especially suitable for pumping chemical liquors, food products, milk, vinegar, gasoline, etc. They are also especially adapted to circulating cooling water for various types of equipment and for fire protection.

They are designed for 100 lbs. working pressure or 230 ft. elevation. They can be furnished with pulleys for belt drive or arranged for direct connection to engine or electric motor.

Made in Iron, Bronze Case and Cams, and All Bronze constructions.

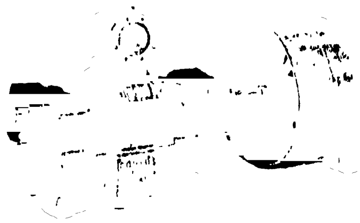


Fig. 1350
Rotary Power Pumps

SPEED AND CAPACITY RATINGS

Size Pump	Gals per Min	PRESSURE POUNDS PER SQUARE INCH							
		30	40	50	60	70	80	90	100
		R P M	R P M	R P M	R P M	R P M	R P M	R P M	R P M
1	25	130	135	141	147	152	155	157	160
	60	288	296	303	307	314	318	327	330
2	50	145	147	150	154	157	160	162	170
	100	276	280	285	289	291	293	296	305
3	75	97	97	97	98	98	100	100	101
	175	226	226	226	228	231	231	233	236
4	150	99	101	101	101	103	104	104	104
	260	165	168	168	168	169	170	170	172
5	175	79	79	79	80	81	82	83	83
	300	132	136	136	137	139	140	142	143
6	275	68	68	68	68	68	68	69	69
	450	111	111	112	112	113	113	114	114

SIZES

No.	Suction Pipe Inches	Discharge Inches Pipe	Discharge Inches Hose	† Tight and Loose Pulleys Inches	Approx Weight In Lbs.
1	3	1½	1½	12 x 3½	325
2	4	2	2	16 x 4	550
3	5	2½	2½	18 x 5	820
4	6	4	2½	24 x 6	1530
5	7	5	2½	30 x 8	1900
6	8	6	2½	36 x 10	2675

†Furnished on pumps for pressures up to 50 lbs only
For pressures of 50 to 100 lbs single tight pulleys will be furnished

SINGLE-STAGE, SINGLE-SUCTION CENTRIFUGAL PUMPS:

Fig. 3000

These pumps are very simple in construction and are useful for all services against heads up to 100 ft. The low first cost of installation, few repairs and great durability and flexibility warrant a careful investigation of this type before any installation is made.

It is particularly adapted to handling thick and gritty liquors owing to the large open water passages. It has been found especially useful in by-product coke plants, chemical factories, metallurgical mills, and as a mine pump.

The Standard Single Stage, Single Side Suction, Horizontal Shaft Centrifugal Pump, known as Fig. 3000, is arranged for belt drive by means of a pulley.

Continued on Next Page

Single-Stage, Single-Suction Centrifugal Pumps
Capacities 1,800 to 252,000 gal. per hr.

In many cases preference is given to direct connected units and, to meet such cases this pump is arranged for direct connection to electric motors, steam engines, steam or hydraulic turbines. Direct connected units are provided with rigid or flexible couplings, as conditions demand. This enables the impeller and the pump shaft to be removed without disturbing the prime mover.

SINGLE-STAGE, DOUBLE-SUCTION CENTRIFUGAL PUMPS:

Fig. 3030

Single-Stage, Double-Suction Centrifugal Pumps
Capacities 4,800 to 480,000 gals. per hr.

This pump is distinguished from our Single-Stage, Single Suction Centrifugal Pump in that the impeller is of the enclosed type and takes its suction from both sides instead of from one side only.

Due to the extremely simple construction of this form of pumping apparatus, it has its particular field of utility in which it cannot be replaced by any other type of pumping machinery. With but a single moving element it can be cared for by unskilled labor. There are no valves to get out of order and when driven by an electric motor, the pump can be arranged to operate automatically. This pump is suitable for all services under heads up to 150 ft. but is particularly adapted to handling coke plant by-products, chemical liquors, for circulating hot water in heating systems and for general water supply. Any method of drive can be provided which may be desired.

CONSTRUCTION:

Impeller Close grained iron, accurately machined to a smooth finish It is of the enclosed type, so designed as to give high efficiency and make it impossible to seriously overload the motive power under any conditions at the specified speed

Shaft Special alloy steel, heat treated, accurately machined to gauge.

Stuffing Box—Provided with brass water sealing rings, which prevent air entering the pump

Casing - Close grained iron, divided horizontally, the two halves bolted together, giving easy access to the interior

Bearings--Bearings are ring oiling type, mounted in housings bolted to lower half of pump casing Housings are provided with removable shells, lined with the best genuine babbitt which is bored and scraped to fit the shaft.

AVERAGE MAXIMUM WORKING PRESSURE 65 POUNDS OR 150 FEET TOTAL HEAD RATINGS BASED ON PUMPING COLD WATER

Pump No.	Pipe Sizes		Av. Capacities* Gals per Min		Standard Pulleys		Maximum Pulleys		Approx. Domestic† Shipping Weights Pounds
	Dis Ins	Suc Ins	Min	Max	Diam Ins	Face Ins	Diam Ins	Face Ins	
2S	2	3	80	200	5	5	7	5	300
2L	2	3			6	6	10	6	500
3S	3	4	150	300	6	6	10	6	600
3L	3	4			7	6	14	6	900
4S	4	5	300	600	7	7	14	7	900
4L	4	5			10	8	18	8	1150
5S	5	6	600	800	8	8	16	8	1100
5L	5	6			10	8	20	8	1650
6S	6	8	800	1200	10	8	20	8	1600
6L	6	8			14	8	26	8	2000
8S	8	10	1200	2100	14	12	24	12	2000
8L	8	10			18	14	30	14	2700
10S	10	12	2100	3300	16	16	30	16	3200
10L	10	12			22	18	34	16	4000
12S	12	14	3300	5000	22	20	40	20	4500
16	16	18	5000	8000	26	24	44	24	7000

*Maximum capacities can be obtained only when Head is greater than 50 feet

†Weight includes pump extended iron bedplate and flexible coupling for direct connected motor engine or turbine or pump mounted upon bedplate and fitted for belt drive including outboard pedestal bearing Weight of driver is not included in the above

Full information covering head power, efficiency speed etc., can be obtained from the nearest office or agent of The Goulds Manufacturing Company

Note —Bronze fitted construction should always be used when pump is desired for pumping hot water

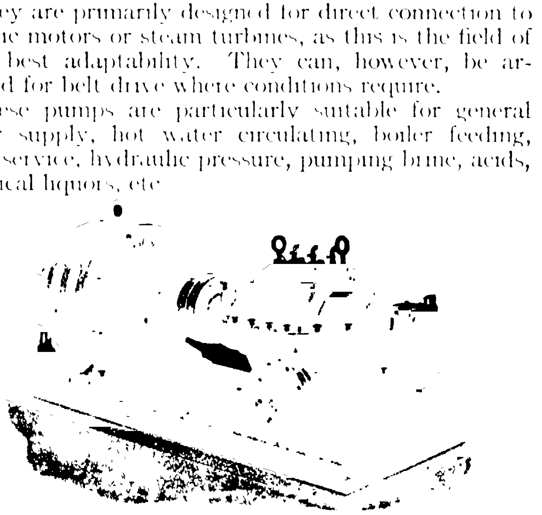
MULTI-STAGE CENTRIFUGAL PUMPS:

Fig. 3300

These pumps are excellent for all classes of installations where a centrifugal pump can be used and where the head is greater than can be efficiently generated in a single stage They can be supplied in any number of stages up to six and for heads up to 580 ft.

They are primarily designed for direct connection to electric motors or steam turbines, as this is the field of their best adaptability. They can, however, be arranged for belt drive where conditions require.

These pumps are particularly suitable for general water supply, hot water circulating, boiler feeding, mine service, hydraulic pressure, pumping brine, acids, chemical liquors, etc



Multi-Stage Centrifugal Pumps

Construction—These pumps embody all the latest features, the value of which experience has fully demonstrated Where the size of the pump is permitted, the casing is horizontally divided with the suction and discharge nozzles cast upon the lower half of the casing The small sizes have vertically divided casings of the sectional type held together by horizontal bolts

The larger pumps can be furnished in from two to five stages. The small sizes can be built up to six stages

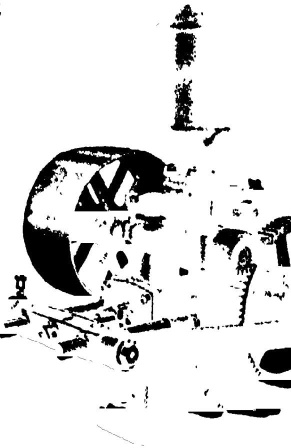
Pump Number	PIPE SIZES		Range of Capacity Gallons per Minute	Maximum Head
	Discharge Inches	Suction Inches		
2S	2	3	50- 100	250 lbs or 580 feet
2L	2	3	50- 100	
3	3	4	100- 200	
4	4	4	175 325	
5	5	5	250- 700	
6	6	6	600 1200	
8	8	8	1000 1500	

Ratings Based on Pumping Clear Cold Water

Continued on Next Page

GOULDS DOUBLE ACTING "PYRAMID" PUMP:

Fig. 1531



For pumping of almost any kind up to 75 lbs pressure or 175 ft head. Especially useful for tank pumping, for water supply for small plants, for pumping light oils, gasoline, benzol, etc Can be used with any form of drive Capacities from 6 to 114 G. P M.

GOULDS DOUBLE-ACTING PISTON VACUUM PUMP:

Fig. 1049

Designed for use in connection with evaporators, vacuum pans, vacuum dryers, surface condensers, stills, etc Arranged for any form of drive. No priming is necessary as both ends of cylinder are always submerged We have several other types of vacuum pumps for special services

Cast iron frame, open hearth steel crank shaft, charcoal iron cylinder, bronze piston, valves rubber discs on bronze grid seats, with cylindrically wound springs Pipe connections—suction at top and one side of cylinder, discharge at other side.

Fig. 1049 Goulds Vacuum Pump

DIMENSIONS AND DISPLACEMENTS

Gallons Displacement per Minute	Pistons		Displacement 1 Rev of Crank Shaft	R P M	Sizes of Pipe		Geared	Single Pulley Inches
	Diameter Inches	Stroke Inches			Suction Inches	Discharge Inches		
170	8	10	4.28 gals	40	5	5	4 to 1	30 x 4
265	10	10	6.73 "	40	5	5	4 to 1	30 x 3
385	12	10	9.72 "	40	5	5	4 to 1	30 x 5
525	14	10	13.22 "	40	6	6	4 to 1	30 x 5
700	14	14	18.51 "	38	6	6	4 to 1	36 x 6
1000	16	16	27.62 "	37	8	8	4 to 1	36 x 6
1350	18	18	39.31 "	35	10	10	4 to 1	42 x 8

GOULDS SINGLE-ACTING TRIPLEX PLUNGER STUFF PUMP:

Fig. 1128

This is a ball valve pump especially suited to pumping thick, heavy liquids, wood pulp and stuff in paper mills, sizing in textile mills, for tar flushing in by-product coke plants, etc. Good for 65 lbs. pressure or 150 feet elevation.

Built to stand constant hard work Charcoal iron cylinders and valve boxes, phosphor bronze plungers, bronze balls and valve seats, frame strong and rigid

Dry Paper in 24 hours at 30 R P M	Plungers		Working Pressure	Capacity 1 Revolution of Crank Shaft	Sizes of Pipe		Geared	Single Pulley Inches
	Diameter Inches	Stroke Inches			Suction Inches	Discharge Inches		
42 tons	8	12	65 lbs	7.83 gals	7	7	5 to 1	30 x 6½
53 "	9	12	65 "	9.91	8	8	5.3 to 1	30 x 8½
66 "	10	12	65 "	12.24 "	8	8	5.3 to 1	30 x 10
95 "	12	12	65 "	17.62 "	10	10	5.3 to 1	30 x 12

GOULDS DIFFERENTIAL POWER WORKING HEAD:

Fig. 1030

For operating single- and double-acting deep well cylinders. Direct connected or belt drive. For heads up to 500 ft and capacities to 1237 G. P. M.

We design and supply complete outfits for deep well pumping of every description.

Stroke Inches	Max Size of Pipe		Geared	Pulleys Tight and Loose Inches	Approximate Weight in Lbs
	Suction Inches	Discharge Inches			
10	6	3	4 to 1	24 x 4	750
16	6	3	5 to 1	30 x 4	1150
24	6	4	5 to 1	36 x 5	2650

Goulds Fig. 1223 Diaphragm Suction Pump

For handling slimes and other semi-fluids in cyanide mills, muddy and gritty water, sewage, etc Simplest pump for above services Can be fitted with pump jack adapting it for engine drive.

Goulds Fig. 1671 Triplex Pressure Pump

For pressure service in oil refineries, cotton oil mills, sugar and glucose refineries, steel works, service in connection with filter and hydraulic presses, etc For pressures up to 7500 lbs., wide range of capacities

BULLETINS:

The following bulletins, any of which will be sent on request, give complete specifications on the various standard types of Goulds Power Pumps.

No. 100	Double Acting, Single Cylinder Piston Pumps
No. 101.	Single-Acting Triplex Plunger Pumps, Outside-Guided Type.
No. 103.	Single-Acting Triplex Plunger Pumps, Large Capacity and High Pressure Type.
No. 104.	Double-Acting Triplex Piston Pumps, Vertical Type.
No 105	Single-Stage, Single Side Suction Centrifugal Pumps.
No 106	Vacuum and Stuff Pumps.
No 107.	Deep Well Triplex Pumps
No. 108.	Deep Well Working Heads and Cylinders
No. 109.	Portable Mine Pumps
No. 110.	Single-Stage, Double-Suction Centrifugal Pumps.
No. 111.	Centrifugal Sump Pumps
No. 112.	Handy Data on Power Pumping
No. 113	Power Rotary Pumps
No. 114	Vertical Single Stage Centrifugal Pumps
No. 115.	Double-Acting Triplex Plunger Pumps, Horizontal Type
No. 116.	Single-Acting Triplex Pressure Pumps.
No. 118	Centrifugal Fire Pump
No 119	Single Stage, Single Suction Centrifugal Pumps, Enclosed Impeller Type
No. 120	Multi-Stage Centrifugal Pumps for General Service.
No 122	Centrifugal Pump Sales Service Data
No 123	Goulds-Lee Turbo Pump Units.

GRINNELL COMPANY, INC.

Manufacturers of Fire Protection Systems, Heating, Industrial, Process and Power Plant Piping

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PRODUCTS AND SERVICES

Complete Engineering and construction service in the design and installation of:

- **Automatic Sprinkler Systems**
- **Steam, Hot Water and Gas Heating**
- **Power and Related Piping**
- **Pipe Bending, Threading, Fabricating and Welding**
- **Fittings, Pipe and Valves**
- **Process Piping and Piping for Acids, Alkalies and other Special Materials**
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- **Water Supply Systems**
- **Gordon Dryers, Humidifiers**
- **Safety Fuel Savers**
- **Constant Level Size Circulating Systems**
- **Spray Cooling Systems**

THE GRINNELL AUTOMATIC SPRINKLER SYSTEM

This system has been in successful operation for more than 30 years. Today over 20,000,000 Grinnell sprinkler heads are safeguarding business property valued at approximately three billion dollars. The average loss per fire in Grinnell protected buildings in over 20,000 recorded fires is less than $300—a reduction of over 96% on the lowest average fire loss previous to the invention of this system.

GRINNELL HEAD WITH SPECIAL GLASS CAP TO PREVENT CORROSION

Operation—When fire breaks out, temperature at the ceiling rapidly increases and causes the fusible strut of the sprinkler head to melt. Thereupon, the glass valve, found only in the Grinnell head, is thrown from its seat on the unique flexible diaphragm. This allows the water to rush out and strike the deflector, which breaks it into a heavy spray. One sprinkler head effectively drenches an area of 80 to 100 square feet.

The operation of the sprinkler head immediately and automatically gives the fire alarm.

Installation—The Grinnell Automatic Sprinkler Systems are factory-assembled to blueprints, fittings being made-on as far as possible by machinery. The result is that the equipment comes to the job ready for quick and botherless installation by our erecting crews. This reduces interference with usual plant operation to a minimum. Each individual system is scientifically designed to secure the utmost protection, at the same time taking fullest advantage of water supply sources and plant arrangement to gain all possible economy in the layout of the system. Our long experience in this work enables us to insure satisfactory service even under the most difficult conditions.

For Chemical Plants—The Grinnell Automatic Sprinkler is particularly adapted for use in Chemical Plants and many installations are in successful operation in plants erected under contract with the U. S. Government, as well as in privately owned plants all over the United States, Canada and abroad. The reason for success is the same as given above, viz.: that all Grinnell installations are specially planned for particular conditions and requirements, not simply following cut-and-dried rules and standards.

Corrosion—In Chemical Plants where fumes and corrosive vapors are more than ordinarily severe, we can install a glass-capped Grinnell sprinkler head which effectively safeguards working parts from becoming inoperative. The glass cap in no wise interferes with the prompt and efficient operation of the sprinkler itself. Under especially severe conditions of corrosion, we advise the coating of all sprinkler-pipes with our acid-resisting and corrosion-proof Bitumastic Enamel.

Grinnell Dry Pipe System—Special care is taken to prevent freezing of pipes and connections in exposed

Continued on Next Page

locations For conditions where freezing temperature is likely to be experienced, we install the Grinnell Dry Pipe System, in which the pipes are normally empty until the opening of a sprinkler head automatically sets the system in operation. We have now further quickened and improved this system by the invention of the Grinnell Dry Valve Accelerator.

Inspection and Service—Within the past year this company has instituted a new department whose sole duty it is to inspect Grinnell Sprinkler equipments and render full reports to the owners on such inspections with practical suggestions for needed changes A competent corps of expert sprinkler engineers are engaged in this work and the success which has already attended it is ample evidence of the necessity of this independent inspection service. It is our sole aim in this inspection work to continually keep Grinnell equipments in the same first class operative condition that they were when originally installed For that reason this service is rendered on a low yearly fee basis which is practically cost to us.

Designs and Estimates—Inquiries addressed to our head office or to any of our branches will immediately receive the attention of our engineering staff, who will promptly furnish any information, designs or estimates required.

GRINNELL INDUSTRIAL PIPING

Evils of Poorly Designed Piping—Present high costs of coal and other supplies necessary to the operation of all kinds of power and heating plants, and the great advance in wages, make efficient and economical performance absolutely necessary. Plant owners must positively stop costly waste, hitherto regarded as unavoidable, and see to it that every unit is producing its maximum capacity at minimum cost.

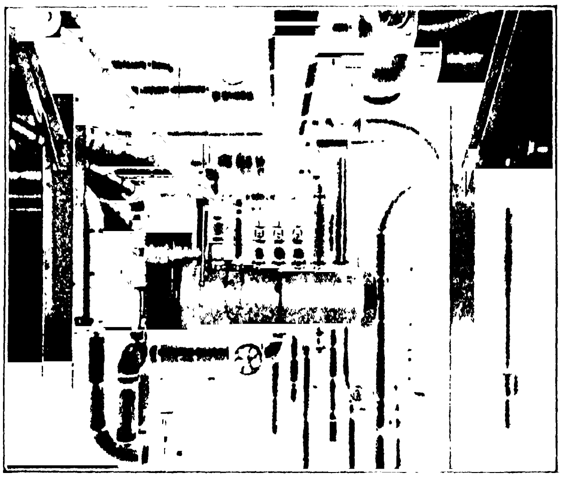
High grade machinery, if served by poorly designed and indifferently installed piping, does not produce the expected results. This condition is frequently brought about either by too small a pipe line, producing a great drop in pressure at the discharge end; by lines with too many short turns; by heaters and other pipe lines so large that the low velocity of flow induces excessive condensation and heat loss; or by too many parallel lines serving the same or similar purposes.

Lack of Flexibility—Too frequently an otherwise good arrangement is spoiled by insufficient flexibility, resulting in overstrained joints due to expansion and contraction. This condition inevitably means great expense for maintaining pipe joints and keeping the line in good repair, and imposes a great injustice on the operative, who must spend his Sundays or leisure hours doing a job which proper design would have rendered unnecessary.

Poor Drainage—Considerable annoyance and expense is caused by piping which becomes pocketed, due to poorly designed hangers or indifferent workmanship, preventing proper drainage Where low points in steam or exhaust piping systems are necessary, great care should be taken to provide proper means of automatically draining these points without depending on draining by hand

Insulation—The question of the advisability of the use of insulation as a means of preventing heat loss is necessarily one to be determined by the engineers designing the piping Great waste may be avoided by the installation of the proper type of insulating materials, applied to lines where the heat loss can not be used to good advantage for heating purposes. Too often pipe lines and other hot surfaces are not properly insulated In many cases, however, insulation is used to correct faulty design of pipe sizes, whereas, if proper circulation could have been maintained by properly equalizing the pipe sizes, the bare surface of the pipe could be used as a very efficient heating surface in place of an equal or greater amount of radiation.

Improvements Effected by Grinnell Piping System —Correct Pipe Sizes—The size of pipe to be used in the designing of all Grinnell piping systems is determined by weighing carefully the two prime factors of **first cost** and **frictional resistance.** There is obviously a correct size of pipe to be used in the case of every pipe line, and this size will be the economical size, both from the standpoint of first cost and the standpoint of frictional resistance caused The frictional resistance means the power consumed in the transmission of the liquid or vapor In Grinnell designed systems these resistances are carefully calculated to give equalization of flow to all apparatus. In the calculation of these resistances, our engineers determine where it is advisable to use long radius bends and necessarily guard against the use of globe type valves where resistance is an important factor.



EVERY DETAIL PLANNED AND EXECUTED BY GRINNELL COMPANY

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Long Radius Bends—Short turn screwed fittings and ordinary globe cut out valves, used in important pipe lines in many plants, cause great loss of pressure due to the sharp turns which result. Globe valves for cut out purposes should be displaced by straight way gate valves and long radius bends used in place of short turn elbows. These bends offer no more resistance to the flow than an equal length of straight pipe, and the distance is actually less than when straight pipe is used with elbows. Long radius bends are almost invariably employed in Grinnell piping systems where it is necessary to provide for expansion and contraction of piping. They are also used in lines where resistance is a prime factor, to cut down the friction caused by ordinary fittings.

Automatic Non-return Valves—These should be used in the steam branches from boilers to the header in every installation of two or more boilers. This type offers a greater protection to the boiler and to the employee than any other form of valve.

Elimination of Overloads—Many overloaded reciprocating engines are now "wire drawing" and straining at their tasks because of long, small pipe lines. They could easily carry the load if large receiver type separators were placed on the throttles. This permits the receiver to become filled with steam at boiler pressure while the engine admission valve is closed, and provides a great volume of full pressure steam ready to enter the cylinder the instant the valve opens.

Utilization of Waste Hot Water—Incalculable loss is incurred every day by permitting hot water waste from heating systems, slashers, drying machines, dry kilns and other steam consuming machines. Both the water and the valuable heat it contains should be recovered and returned directly to the boiler.

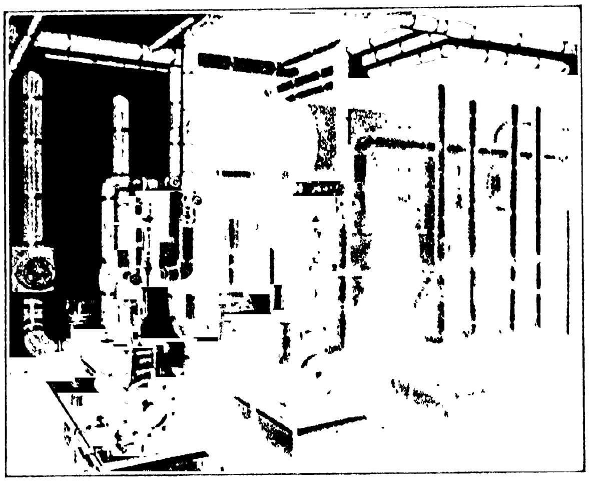
Savings Under Grinnell Systems—The installation of modern piping systems and appliances produces an immediate saving in coal consumption. In many cases such savings have paid the entire cost of the improvements in a few years.

Many years of experience in widely varying types of plants have qualified us to undertake these improvements with an efficiently organized corps of engineers, all specialists in one or another of the several branches. We will cheerfully send an expert to any plant to survey and estimate the cost of such changes.

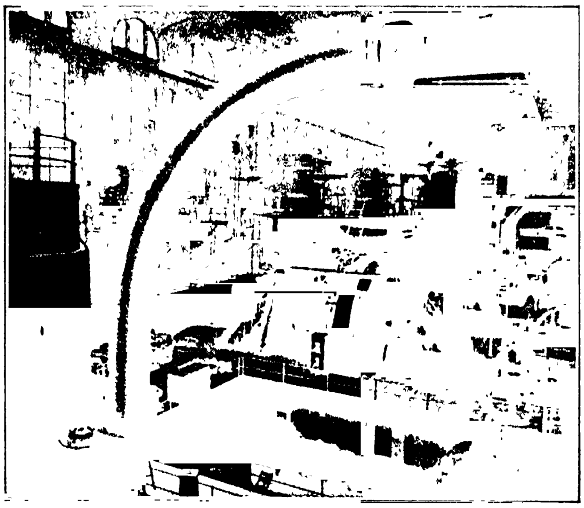
Flexibility and Simplicity of Grinnell Systems—The necessity for flexibility in power plant design can not be too strongly emphasized. The piping systems must be laid out, and the valves so arranged that the operating engineer can, at will, cut out one or more boilers, engines, or other steam-using machines, for repairs or renewals, replacing them with standby machines which, unless the piping system is properly planned, may be found useless in time of need.

While it is desirable that an adequate number of valves, etc., be provided, it is equally necessary that they be kept down to the least number commensurate with efficiency and safety. Long circuitous lines should be made as direct as practicable and proper expansion bends provided on rigid lines to allow for the absorption of expansion and contraction.

Simplicity in piping is of the utmost importance in order to keep first cost within reasonable limits, to insure economical operation and reduce upkeep.



A TYPICAL GRINNELL PIPING INSTALLATION



A GOOD EXAMPLE OF GRINNELL PIPE BENDING

Continued on Next Page

PIPING FOR CHEMICAL PLANTS AND OTHER SPECIAL PURPOSES

Not only is Grinnell Company, Inc., skilled in designing efficient steam or water lines for ordinary purposes, but furnishes and installs all piping required in processing plants, or plants which involve the use or treatment of acids and alkalis

We furnish pipe made of steel, cast iron, genuine wrought iron, and spiral riveted pipe, black and galvanized. We also furnish brass, copper, and aluminum pipe, pipe that is lined with various metals or alloys, and specially treated acid resisting pipes, with suitable valves and fittings for all the above classes of materials.

Gaskets, packings, and specially designed joints will be provided as each specific condition requires

Acting under the direction of the chemical engineer, or some other qualified attache of the plant, Grinnell Co., Inc., will cheerfully submit proposals for piping equipment for pulp and paper mills, sugar refineries, soap factories, fertilizer works, bleacheries, dyeing plants, phosphate works, cement mills, gas plants, oil refineries, cotton oil mills, etc.

CONSTANT LEVEL CIRCULATING SIZE SYSTEM

This system is simple in design and operation, economical in cost and manipulation, and it satisfactorily maintains circulation, uniform temperature and level. It is splendidly adapted to the conditioning of the finest or coarsest yarns, and improves the quality and increases the output of any textile factory. We are prepared to furnish and install complete outfits of design and material best suited to individual needs and conditions

SPRAY COOLING SYSTEMS

Where only a limited quantity of water is available for cooling purposes, a spray system can be arranged over any small reservoir or pond and the warm condensing water, quickly cooled to a temperature several degrees below that of the atmosphere, can be used and cooled over and over again at low cost

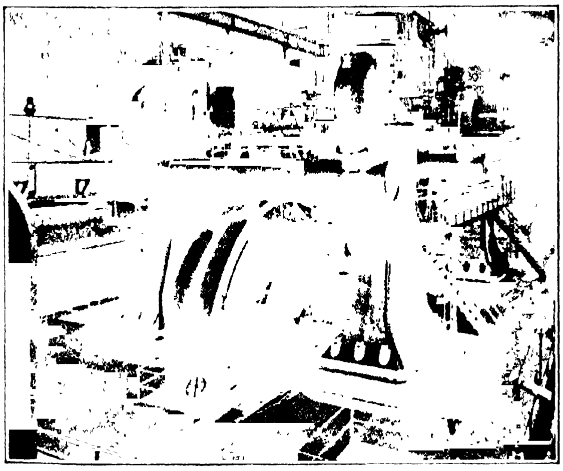
When the plant does not possess a pond of water, a suitable reservoir may be built or a shallow tank constructed on the roof of a building and the system installed there. Such a system is simple in design, inexpensive in cost and economically replaces the unsightly, inefficient cooling tower.

HUMIDIFYING SYSTEMS

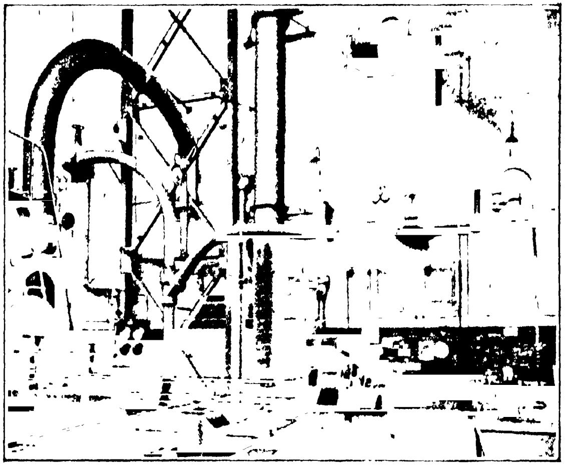
Through our affiliations with American Moistening Company, we are in a position to design and install complete humidifying systems, using devices long standard in this work. An especially reliable and sensitive control is a feature of all American Moistening Company equipments, which include sectional, fan type, high duty, and ventilating humidifiers; atomizer or compressed air systems; air conditioning room equipment, etc.

COMPRESSED AIR CLEANING SYSTEMS

All textile and many other plants suffer from the accumulation of lint and dust on inaccessible parts of the machinery. The installation of a small air compressor, with a simple piping system with hose connections conveniently located, permits the thorough cleaning of all machinery.



CROSS-COMPOUND PIPING INSTALLED BY GRINNELL COMPANY



GRINNELL HIGH PRESSURE PIPING IN A CENTRAL STATION

Continued on Next Page

Each air hose, 50 to 60 ft. in length, is provided with a lever valve nozzle at one end and a quick motion coupling at the other end. The patented quick motion coupling with which the hose and every station is equipped makes possible very quick changes from station to station. A few operators can quickly and thoroughly clean an entire mill.

GRINNELL HEATING SYSTEMS

Many complaints of inefficient heating arise from improperly designed or unsuitable heating systems. The whole subject of economical heating should be approached from a purely scientific standpoint, covering not only the cubic contents of the building but also its structural details and the suitability of one or another heating system to the particular building under consideration.

It is by careful pre-consideration of all these elements that Grinnell heating engineers are able to install a system that not only produces the required degrees of heat but does so on a minimum coal consumption.

For many mills and other industrial plants the Grinnell system of semi-automatic temperature control will provide ample heat, graduated to meet internal conditions, and regardless of outdoor temperature, at a far lower cost per unit than any other system.

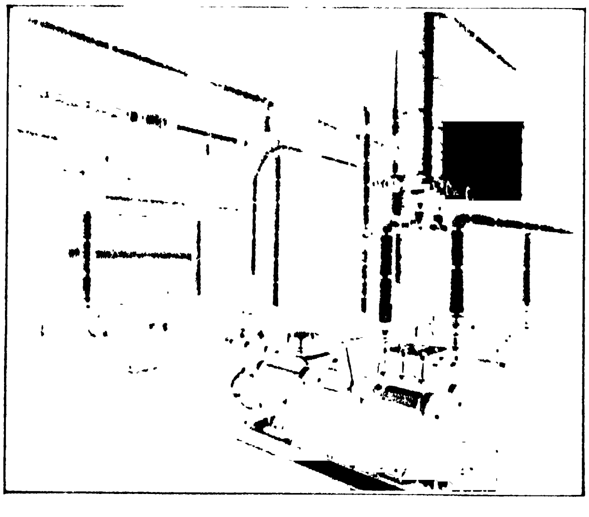
Remodeling Old Heating Plants—Heating plants often give unsatisfactory results due to poor design or repeated radiation additions without proper increase in the capacity of the piping. Natural deterioration of the system also causes low efficiency. We are in an excellent position to remodel such plants and put them in perfect working condition.

When factory buildings are increased in length a change in the method of heating is often made necessary. A careful study and analysis of every such case will be made by an expert heating engineer. Old systems, apparently obsolete and practically worthless, may be brought up to a state of high efficiency under such skilled remodeling, thereby saving many thousands of dollars.

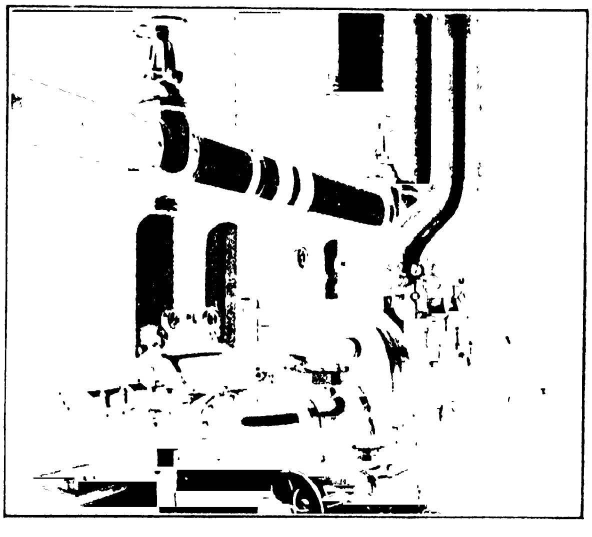
The highly trained corps of specialized piping engineers maintained by Grinnell Company, Inc., and its experienced construction department, insure proper design as well as satisfactory installation and operation. The plant owner or his designing engineer will receive capable and ready cooperation from these experts in the development of his plant.

STEAM POWER PLANTS

Our Engineering Department is fully qualified to design complete piping systems for power plants serving chemical plants, electric lighting plants, electric power plants, water works, steel rolling mills, blast furnaces, copper mines, saw mills, oil mills, pulp and paper mills, tanneries, bleacheries, dyeing plants, water filter plants, phosphate mines, fertilizer factories, or any others of similar nature. We are prepared to furnish or fabricate in our shops all equipment and material required, erecting same in the most approved manner.



FEED PIPING INSTALLATION BY GRINNELL COMPANY



GRINNELL HIGH PRESSURE POWER PIPING IN POWER HOUSE OF THE RHODE ISLAND COMPANY

GRIEBEL INSTRUMENT COMPANY, INC.

CARBONDALE, PA.

PRODUCTS

Precision Volumetric Glassware, Chemical Laboratory Glassware, Scientific Glass Apparatus, Precision Thermometers and Hydrometers, with or without Bureau of Standards Certificates.

SPECIALTIES

- **Acid Drip Cups**
- **Beakers**
  - Insol
  - Nonsol
  - Pyrex
- **Burettes**
- **Calcium Chloride Tubes**
- **Cylinders**
- **Dropping Bottles**
- **Extractors**
- **Filter Paper**
- **Funnels,** Bunsen, with long thin stems
- **Gas Apparatus**
- **Gas Bottles**
- **Gas Burettes**
- **Gas Pipettes**
- **Hydrometers** for every Industry
  - Plain
  - Combination
- **Kipp's Gas Generators**
- **Pipettes**
- **Rubber Stoppers and Tubing**
- **Separatory Funnels**
- **Specific Gravity Bottles**
- **Thermometers**
  - With paper or milk glass scale
  - Straight or angle
- **Thermometers,** Beckman's
- **Thermometers,** engraved on stem

GLASS BLOWING SERVICE

We have one of the best equipped glass blowing shops in the country employing only the best of skilled glass blowers and engravers. With these facilities we are fully prepared to make any special glass apparatus, no matter how delicate or intricate, according to sketches and specifications

When you consider that we have been supplying, for several years, some of the largest users of laboratory glassware and supplies, you can feel assured that any glass blowing commission awarded us will be carefully and most satisfactorily fulfilled.

PRECISION VOLUMETRIC GLASSWARE

All of our Precision Volumetric Glassware is produced strictly in accordance with the specifications of the U S Bureau of Standards, and graduated by weighing at 20 C

Flasks—Volumetric to meet the Specification of the U S Bureau of Standards, Washington, D C, without Control Stamp offered

With our unofficial factory certificate

Without Stopper or with Glass Stopper

Capacity cc	50	100	200	250	500	1000	2000

With certificate from the U S Bureau of Standards Without Stopper or with Glass Stopper

Capacity cc.	50	100	200	250	500	1000	2000

Cylinders—Precision, graduated by weighing at 20°C in accordance with the Specification of the U. S Bureau of Standards, Washington, D C, with unofficial factory certificate

Capacity cc	10	25	50	100	250	500	1000	2000
Graduated in	1-10	1 5	1 2	1	5	5	10	25

With certificate from the U S Bureau of Standards

Capacity cc.	10	25	50	100	250	500	1000	2000
Graduated in	1-10	1 5	1 2	1	5	5	10	25

Burettes—Precision, graduating by weighing at 20°C in accordance with the specification of the U S. Bureau of Standards, Washington, D C., with individual control number, time of outflow, all around graduations for the whole centimeters and semicircular graduation for the fractions Offered with our unofficial factory certificate

With Pinchcock, Geisler Stopcock, Fresenius Stopcock or Three-way Stopcock

Also furnished with certificate from the U. S Bureau of Standards.

Capacity cc.	10	25	50	100
Sub-divisions	1-20	1-10	1-10	1-5

Pipettes—Precision, Volumetric, Normal. Graduated to meet the requirements of the U S Bureau of Standards Without control stamp, with unofficial factory certificate Also with control stamp

Capacity cc.	1	2	5	10	25	50	100	200

Mohrs, Precision. With unofficial factory certificate Also with control stamp.

Capacity cc.	1	1	2	2	5	10	25	50
Graduated in	1-100	1-10	1-50	1-10	1-10	1-10	1-10	1-5

Cement Flasks—Specific Gravity Bottle, Le Chatelier, New Form, in accordance with the U S. Bureau of Standards, Washington, D C., requirements and as used in the U. S. Government test for Portland Cement See Circular No 33 of U. S. Bureau of Standards.

Without or with certificate.

GROEN MFG. CO., INC.

Established 1905

Coppersmiths

4529-37 ARMITAGE AVE., CHICAGO, U. S. A.

PRODUCTS

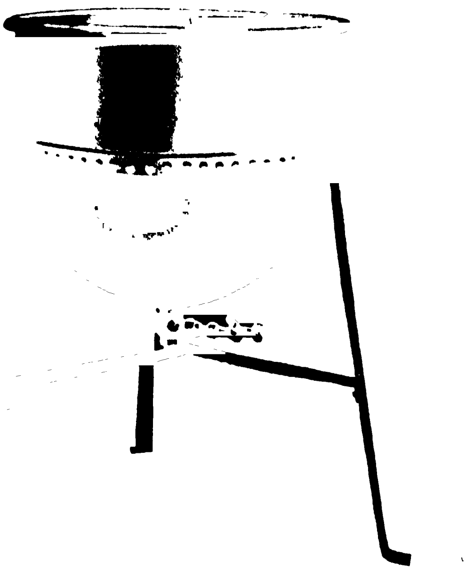
All kinds of Copper, Aluminum, Monel Metal and Steel Equipment for Chemical and Allied Industries.

- **Coils of any description**
- **Condensers**
- **Distilling Apparatus**
- **Extracting Apparatus**
- **Dye House Apparatus**
- **Tanks**
- **Heaters**
- **Coolers**
- **Jacketed Kettles**
- **Candy Kettles**
- **Varnish Kettles**
- **Varnish Kettle Trucks**
- **Agitator Kettles**
- **Vacuum Pans**
- **Expansion Joints**
- **Evaporators**
- **Pipe Bends or Shapes**
- **Revolving Pans**
- **Tin Lined Equipment**
- **Milk Condensing Pans**
- **Acid Plants**
- **Vinegar and Yeast Plant Equipment**
- **Spun or Drawn Products**
- **Castings in Brass, Bronze or Aluminum**

FACILITIES

We have an excellent equipped shop capable of handling the largest class of equipment, also of turning out production work of smaller sizes

To illustrate our varied equipment we have facilities to spin 3/16″ metal up to 60″ diameter. Weld or braze any metals by acetylene gas or fire. Bend pipe up to 14″ in diameter. A power hammer capable of hammering 15′ diameter shapes, and move all materials by traveling hoists.



THESE COPPER STEAM JACKETED KETTLES 5 TO 75 GALLON ARE CARRIED IN STOCK

SERVICE

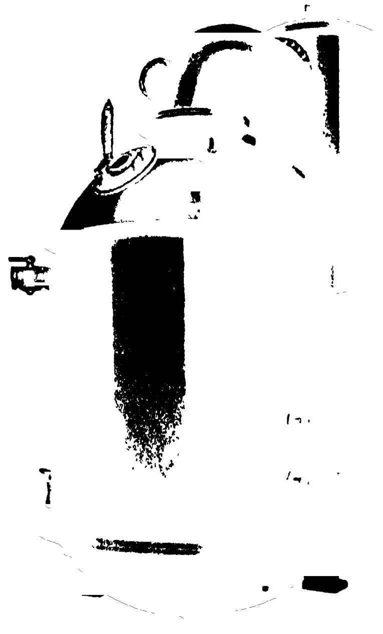
At all times we guarantee to make delivery as specified, and assure prompt replies to inquiries. Our very wide experience on all classes of equipment at time may be very beneficial to your engineers, and it is given with pleasure, binding yourselves under no obligation whatever.

GUARANTEE

We guarantee all materials to be as specified and will replace any proving defective. Workmanship and finish at all times to be first class.

ESTIMATES

Estimates are always cheerfully given from drawings or specifications of special apparatus or materials, if these are not available a rough pencil drawing stating purpose and sizes is sufficient, but before proceeding with manufacture we would submit detailed drawing made by our engineering department for your approval.



THIS VACUUM PAN IS USED VERY EXTENSIVELY IN MILK CONDENSING PLANTS, AND CAN BE SUCCESSFULLY USED ON ANY LIQUID

GRIEBEL INSTRUMENT COMPANY, INC.

CARBONDALE, PA.

PRODUCTS

Precision Volumetric Glassware, Chemical Laboratory Glassware, Scientific Glass Apparatus, Precision Thermometers and Hydrometers, with or without Bureau of Standards Certificates.

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Flasks--Volumetric to meet the Specification of the U S Bureau of Standards, Washington, D C , without Control Stamp offered

With our unofficial factory certificate
Without Stopper or with Glass Stopper

Capacity cc	50	100	200	250	500	1000	2000

With certificate from the U S Bureau of Standards Without Stopper or with Glass Stopper

Capacity cc.	50	100	200	250	500	1000	2000

Cylinders—Precision, graduated by weighing at 20°C in accordance with the Specification of the U. S Bureau of Standards, Washington, D C, with unofficial factory certificate

Capacity cc	10	25	50	100	250	500	1000	2000
Graduated in	1-10	1-5	1-2	1	5	5	10	25

With certificate from the U S Bureau of Standards

Capacity cc.	10	25	50	100	250	500	1000	2000
Graduated in	1-10	1-5	1-2	1	5	5	10	25

Burettes—Precision, graduating by weighing at 20°C in accordance with the specification of the U S. Bureau of Standards, Washington, D C., with individual control number, time of outflow, all around graduations for the whole centimeters and semicircular graduation for the fractions Offered with our unofficial factory certificate

With Pinchcock, Geisler Stopcock, Fresenius Stopcock or Three-way Stopcock

Also furnished with certificate from the U. S Bureau of Standards.

Capacity cc.	10	25	50	100
Sub-divisions	1-20	1-10	1-10	1-5

Pipettes—Precision, Volumetric, Normal. Graduated to meet the requirements of the U S Bureau of Standards Without control stamp, with unofficial factory certificate Also with control stamp

Capacity cc.	1	2	5	10	25	50	100	200

Mohrs, Precision. With unofficial factory certificate Also with control stamp.

Capacity cc.	1	1	2	2	5	10	25	50
Graduated in	1-100	1-10	1-50	1-10	1-10	1-10	1-10	1-5

Cement Flasks—Specific Gravity Bottle, Le Chatelier, New Form, in accordance with the U S. Bureau of Standards, Washington, D C., requirements and as used in the U. S. Government test for Portland Cement See Circular No 33 of U. S. Bureau of Standards.

Without or with certificate.

C. L. [illegible]   W. G. Hudson   Edward Burns   W. W. Ricker

GUARANTEE CONSTRUCTION COMPANY

Consulting, Designing and Contracting Engineers
112 CEDAR STREET, NEW YORK, N. Y.

PRODUCTS AND SERVICES

Complete design, construction and equipment of chemical plants, structures of steel, timber and reenforced concrete, labor saving equipment, conveyors and storage systems.

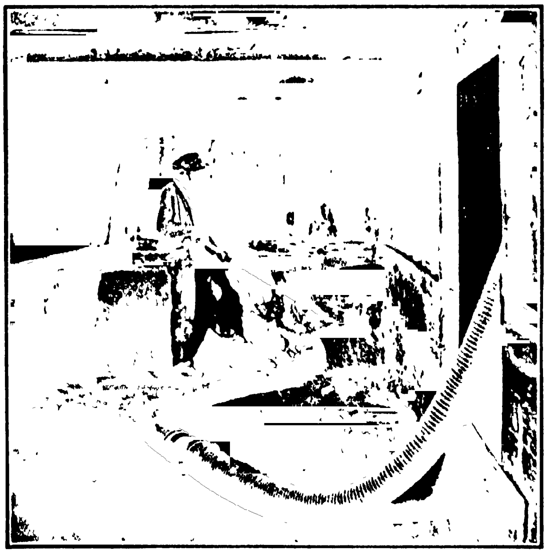
THE AIRVEYOR

An improved, patented pneumatic conveying system for handling granular and pulverized materials, dustless, noiseless and safe

"PULLING IT OUT AT 30 TONS PER HOUR"

The Airveyor handles practically any material which can be conveyed in closed ducts. Illustration below shows Airveyor unloading cargo of Copra at 40 tons per hour.

UNLOADING CARGO OF COPRA AT THE RATE OF 40 TONS PER HOUR



UNLOADING SODA ASH WITHOUT DUST

The Airveyor solves the problem of unloading finely pulverized materials such as lime or soda ash. Note the absence of dust in the car of soda ash while the Airveyor is operating.

Continued on Next Page

GRIEBEL INSTRUMENT COMPANY, INC.

CARBONDALE, PA.

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  - Pyrex
- **Burettes**
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- **Filter Paper**
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With our unofficial factory certificate
Without Stopper or with Glass Stopper

Capacity cc 50 100 200 250 500 1000 2000

With certificate from the U S Bureau of Standards Without Stopper or with Glass Stopper

Capacity cc. 50 100 200 250 500 1000 2000

Cylinders—Precision, graduated by weighing at 20°C in accordance with the Specification of the U. S Bureau of Standards, Washington, D C, with unofficial factory certificate

Capacity cc	10	25	50	100	250	500	1000	2000
Graduated in	1-10	1	5	1 2	1	5	5	10	25

With certificate from the U S Bureau of Standards

Capacity cc.	10	25	50	100	250	500	1000	2000
Graduated in	1-10	1	5	1 2	1	5	5	10	25

Burettes—Precision, graduating by weighing at 20°C in accordance with the specification of the U S. Bureau of Standards, Washington, D C., with individual control number, time of outflow, all around graduations for the whole centimeters and semicircular graduation for the fractions Offered with our unofficial factory certificate

With Pinchcock, Geisler Stopcock, Fresenius Stopcock or Three-way Stopcock

Also furnished with certificate from the U. S Bureau of Standards.

Capacity cc.	10	25	50	100
Sub-divisions	1-20	1-10	1-10	1-5

Pipettes—Precision, Volumetric, Normal. Graduated to meet the requirements of the U S Bureau of Standards Without control stamp, with unofficial factory certificate Also with control stamp

Capacity cc. 1 2 5 10 25 50 100 200

Mohrs, Precision. With unofficial factory certificate Also with control stamp.

Capacity cc.	1	1	2	2	5	10	25	50
Graduated in	1-100	1-10	1-50	1-10	1-10	1-10	1-10	1-5

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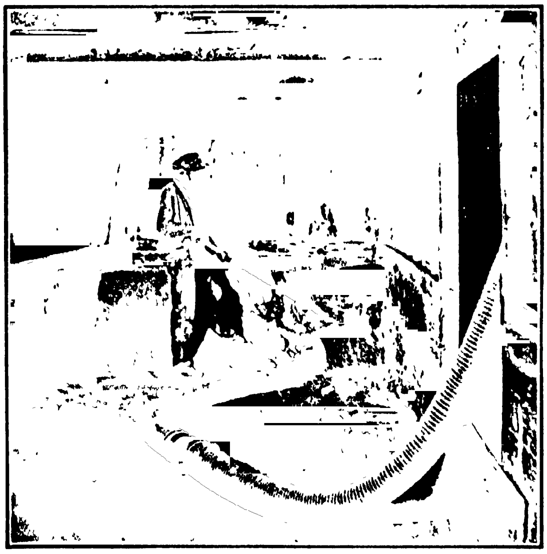
UNLOADING CARGO OF COPRA AT THE RATE OF 40 TONS PER HOUR



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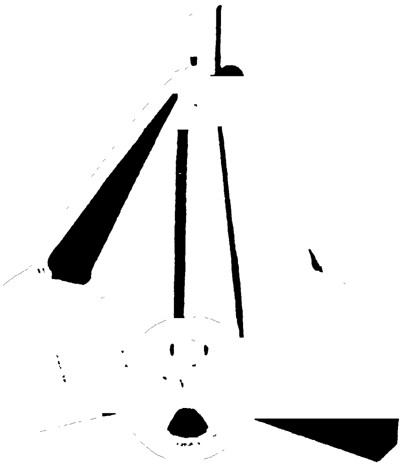
Continued on Next Page

HAISS "CONTRACTOR" CLAMSHELL BUCKET

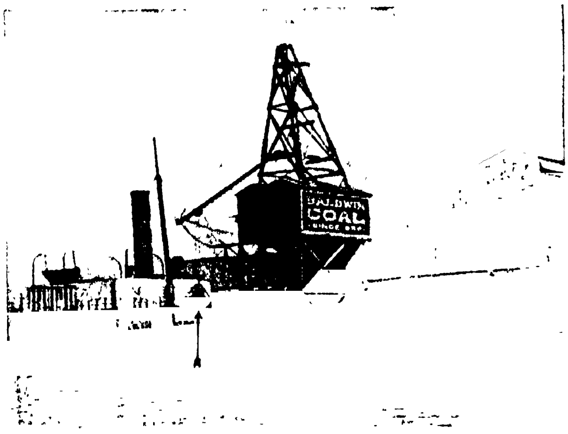
Built strong, of simple design, but employing the most powerful of mechanical principles in its digging action. Constructed with steel flat-link side bars, rigid cast steel blade arms and bowl braces, and round connecting rods; cast steel head, large rope deflecting idler; wide groove power wheel on big steel shaft and rope guards; bronze bushings, steel pins; Steel shoes around entire cutting edges of bowls. It is a bucket one need not be afraid of using—it is made for rough work. Because of the extra heavy bowl plates and all the steel castings, the closing jaws will not overlap. It hangs straight and goes deep into chemicals, fertilizers, coal, coke, ashes, sand, stone, etc. Teeth can be attached. Powerful rope reeved type buckets also in stock. "Contractor" type bucket capacities—¼, ½, ¾, 1, 1¼, 1½, 1⅝, 2 cu. yds.



HAISS "CONTRACTOR" CLAM SHELL BUCKET

UNLOADING TOWERS (FIXED OR MOVABLE)

High speed Haiss Unloading Towers are equipped with Haiss steam or electric hoisting engines, clam shell buckets and all fittings. Complete designs submitted for any capacity, and for conforming to local conditions. The towers may be movable or of the stationary type.

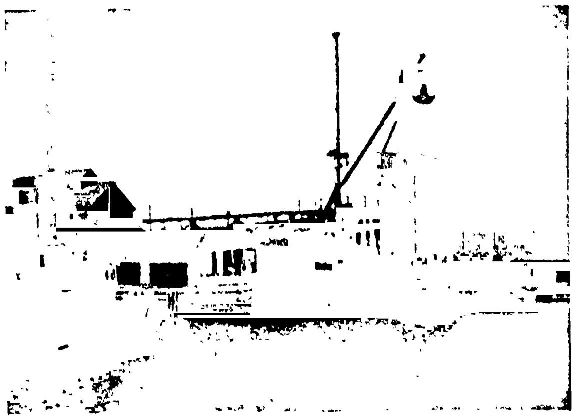


UNLOADING TOWER

LOAD IT MECHANICALLY

MAST AND BOOM UNLOADING PLANT

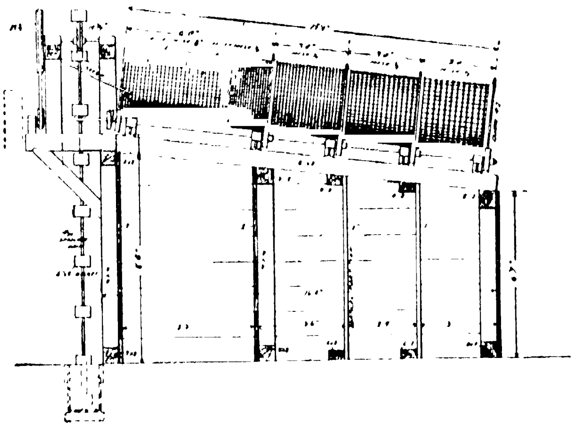
The few inexpensive units for a Mast and Boom rig make it the lowest cost equipment for automatic unloading plants. Haiss Co. builds the engine, bucket, fittings, etc., complete.



MAST AND BOOM UNLOADING PLANT

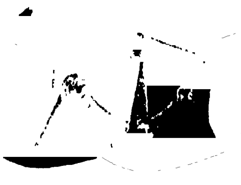
REVOLVING SCREENS (ON TRUNDLE SHAFTS)

These screens contain no obstructing center shaft or arms; built in any length, but generally 14 or 18 feet long, and 42 or 48 inches in dia., and can give any number and sizes of material separations. Bucket elevators supplied.



REVOLVING SCREEN

HOPPER GATES (VARIOUS TYPES)



HOPPER GATE

Haiss Double-lip Gates are bolted under hoppers holding chemicals, coal, ashes, sand, stone, etc., and are built with 18″ x 18″ or 24″ x 24″ square openings. The adjustable counterweighted handle opens and closes the gate as easily on lump as on fine materials.

UNLOAD IT MECHANICALLY

HARDINGE COMPANY

Conical Ball and Pebble Mills

120 BROADWAY, NEW YORK, N. Y.

Salt Lake City, Utah, Newhouse Building
London, England, 11-13 Southampton Row

WORKS
York, Pa
Frith, England

PRODUCTS

Manufacturers of the Hardinge Conical Ball and Pebble Mill for grinding and pulverizing. Engineers for design and construction of metallurgical and industrial plants.

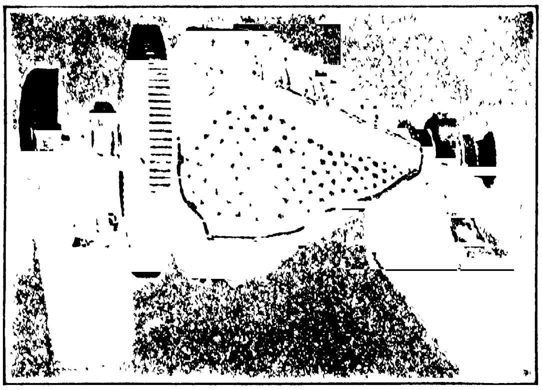
USES

The Hardinge Conical Mill grinds both wet and dry ores for metallurgical processes and materials for industrial uses, from a maximum size of three inches to a product of any degree of fineness. Some of the materials ground are

Silica
Barytes
Pigments
Mica
Sulphur
Foundry Waste
Coal
Cement Clinker
Limestone
Phosphate Rock
Feldspar
Carborundum
Gold Ores
Silver Ores
Copper Ores
Lead Ores
Zinc Ores
Tungsten Ores

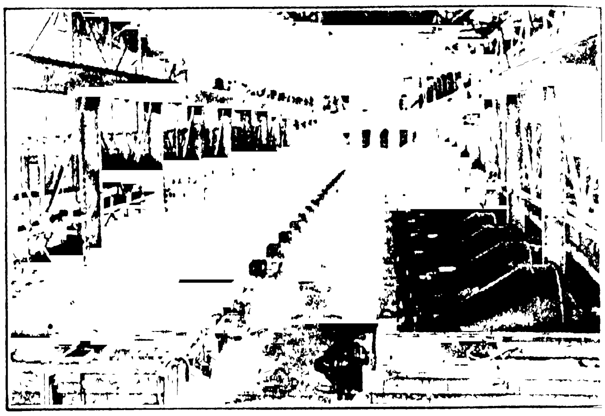
PRINCIPLE OF OPERATION

The Hardinge Conical Mill operates on the principle of multiplicity of grinding bodies rotated in a conical drum. These bodies, in dropping, crush and grind the material passing through the mill. In the conical mill there exists the logical law of pulverization, i. e., in stages. The large material on entering the mill is crushed by the large balls or pebbles which always remain near the feed end (largest number), due to the classifying action of the cone, and as this partially reduced material travels forward it is further ground by the smaller grinding media, and so on until it is discharged at the apex of the cone. The effect of such an action is to proportion the energy to the work required, or in other words, "Use a sledge hammer to drive a spike and a tack hammer to drive a tack." To grind fine material with large balls or pebbles is a waste of energy and to try to crush large feed with small grinding media is futile. This latter action does occur where no natural segregation exists, as in the conical mill.



HOW BALLS SEGREGATE DURING OPERATION OF A HARDINGE CONICAL MILL

The net result of this principle is: (A) Action within the conical mill in proportioning the energy to the work performed saves power. (B) A greater range of grinding is made possible as different sizes are roughly segregated and do not interfere with one another. (C) The capacity of a given size of unit is increased since the ground material is actually forced forward by the classifying effect of the discharge cone. (D) Wear is greatly reduced, as less grinding media are required to effect a given production, and those that are used do effective work, which saves the lining as well. (E) The conical shape insures extreme rigidity and simplicity of construction. Mechanical troubles during operation are almost unknown. Labor costs are next to nothing.



SIXTY-FOUR 8 FT. DIAMETER HARDINGE CONICAL MILLS OPERATED BY TWO MEN PER SHIFT

APPLICATION TO INDUSTRIAL PROCESSES

Wet Grinding

Granular Product—By properly adjusting the operation of the mill, the material can be made to travel through rapidly, thus insuring a very uniform and granular product.

Fine Product—Any product of any fineness up to 350 mesh can be obtained. The equipment used is very simple, self-contained and economical in operation.

Dry Grinding

Granular Product—Due to the principle of operation of the conical mill the "dead" effect of dry as compared to wet material actually aids the operation and causes a rapid travel of the material through the mill which insures a granular and uniform product.

Fine Product—A product of any fineness desired, up to 350 mesh, is readily obtainable. The operation is extremely simple and economical.

APPLICATION TO METALLURGICAL PROCESSES

The Hardinge Conical Ball and Pebble Mills have been used for a number of years grinding ores and minerals of all kinds, the product being suitable for table concentration, flotation, cyanidation and amalgamation.

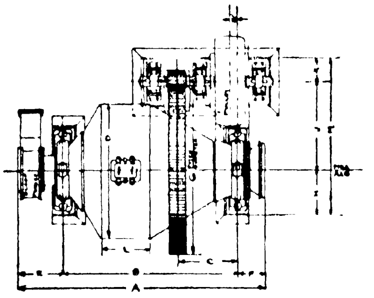
Information Required:

1. Name and address
2. Character of material
3. Grinding capacity in tons per hour.
4. Maximum size to be fed Hardinge Mill.
5. Fineness of product desired.
6. Grinding wet or dry.
7. Subsequent process.

Continued on Next Page

THE HARDINGE CONICAL BALL MILL

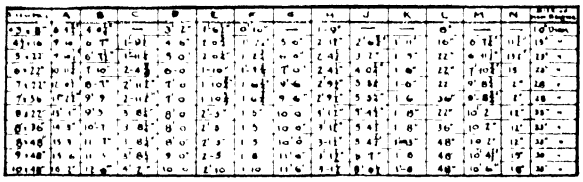
This type has become very popular within the last few years owing to the large range of reduction possible and large capacity per unit. It is used for both wet and dry grinding processes. Forged steel balls (5" to 2" in diameter) are used where large material is fed to the mill. Cast iron balls (3" to ¾" in diameter) are used for regrinding. The exact sizes and proportions depend upon operating conditions.



TYPE "B" HARDINGE CONICAL MILL

GENERAL DIMENSIONS OF CONICAL BALL MILLS

The Standard Ball Mill Is of Type "B" Construction



CONICAL BALL MILL SPECIFICATIONS

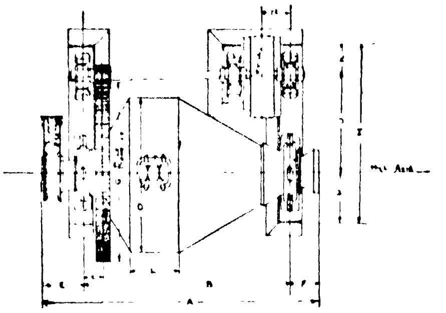
Size of Mill	Floor Space	Approximate Weights, Pounds			H P to Run	Size of Motor H P	Capacity in Tons Per Hour			Code Word
		Mill	Lining	Ball Chg			1½" to 8 mesh	1½" to 18 mesh	½" to 65 mesh	
3' x 8"	5'x 7'	3800	1400	1000	5	7½	¾	½	½	Bolus
4½'x16"	7'x10'	6600	4800	4500	18	25	2	1	1½	Bomdu
5' x22"	9'x10'	10200	7800	7500	30	35	3	2	2½	Bonhu
6' x22"	10'x11'	12000	10000	12000	45	50	6	4	5	Boots
[illegible]	11'x12'	14000	14000	20000	70	75	10	7	8	Botun
7' x36"	11'x13'	15000	16300	27000	90	100	12	8	9½	Boune
8' x22"	12'x14'	20300	17700	30000	100	100	14	9½	11	Calma
8' x36"	12'x14'	22000	19400	34000	135	150	18	14	16	Cacuq
8' x48"	12'x15'	27400	22600	38000	170	175	24	19	21	Cactu
9' x48"	13'x16'	35000	30000	53000	230	250	33	26	29	Caddi
10' x48"	13'x16'	40000	35000	68000	300	350	45	35	38	Cadut

This capacity table must be considered as an approximation only, as every material varies in its resistance to grinding

INSTALLATION OF HARDINGE MILLS AND HUM-MER SEPARATORS GRINDING DRY

THE HARDINGE CONICAL PEBBLE MILL

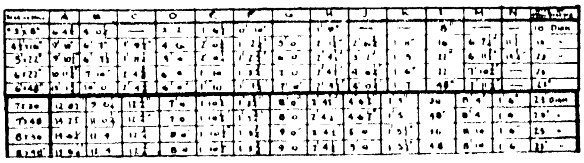
This type is particularly desirable where a uniform product is desired, also where the cost of operating a ball mill would exceed that of the equivalent pebble mill. This is usually the case where a very fine product is required. Grinding is done in open or closed circuit, depending upon operating conditions. Flint pebbles (5" to 1" in diameter) are used as grinding media, the sizes and proportions depending upon operating conditions.



TYPE "A" HARDINGE CONICAL MILL

GENERAL DIMENSIONS OF CONICAL PEBBLE MILLS

Conical Pebble Mills from 3 Ft. to 6 Ft. Dia. Inclusive are of Type B Construction. The 7 Ft. and 8 Ft. Mills are of Type A Construction.



CONICAL PEBBLE MILL SPECIFICATIONS

Size of Mill	Floor Space	Approximate Weights, Pounds			H P to Run	Size of Motor H P	Capacity in Tons Per Hour			Code Word
		Mill	Lining	Ball Chg			½" to 28 mesh	½" to 48 mesh	8 mesh to 200 mesh	
3' x 8"	5'x 7'	3800	1500	300	3	5	½	¼	⅛	Bomba
4½'x16"	7'x10'	6600	3500	2500	8	10	1	½	¼	Bonan
5' x22"	8'x11'	10200	4500	3500	12	15	1½	1	⅓	Bonno
6' x22"	9'x11'	10000	7500	4500	18	25	2½	1½	1	Boppa
6' x48"	9'x13'	12000	9000	5500	27	35	3	2½	1¼	Borou
7' x30"	10'x13'	13000	10000	9000	35	50	4	3½	1¾	Boubh
7' x48"	10'x14'	14000	12000	10000	40	50	4½	3¾	2	Bovin
8' x36"	11'x15'	16000	16000	12000	55	60	7	5	2½	Cackl
8' x48"	11'x16'	17000	20000	14000	65	75	8½	6	3	Cadve

As in the case of the ball mill, the capacity of a given size of mill will differ with every material

HARDINGE MILL AND CLASSIFIER INSTALLATION FOR GRINDING WET TO ANY FINENESS DESIRED

HANOVIA CHEMICAL & MFG. COMPANY

Manufacturers of Scientific and Chemical Laboratory Apparatus and Transparent Quartz Glass Laboratory Ware

NEWARK, N. J.

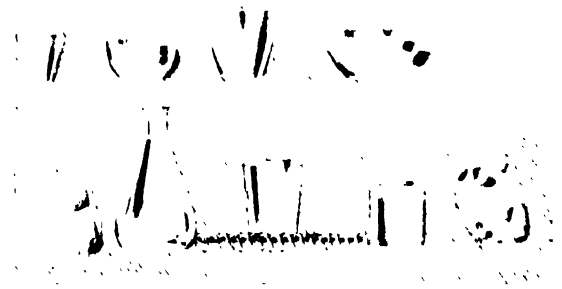
NEW YORK OFFICE 30 CHURCH STREET

PRODUCTS

Apparatus of Transparent Pure Fused Quartz; Quartz Mercury Arc Lamps for Scientific and Industrial use; Electric Laboratory Furnaces; Electric Temperature Measuring Instruments.

HANOVIA QUARTZ-GLASS WARE

Fused rock crystal



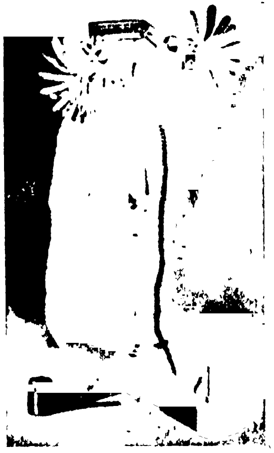
TRANSPARENT QUARTZ GLASS

Our quartz glass is derived from the purest rock crystal and manufactured under scientific methods at our Newark plant. The resultant product is a pure quartz glass of uniform properties and characteristics. The altogether unusual properties found in this ware make it indispensable to many laboratories. It is perfectly transparent, non-hygroscopic, insoluble in water and most acids, its melting-point 1600° C.; its coefficient of expansion between 1° and 1000° C. is 0.00000054, and its specific weight *2.22*.

We are equipped to manufacture special quartz ware apparatus from specifications and pride ourselves on turning out intricate laboratory implements that other manufacturers cannot attempt.

Our descriptive catalog should always be at hand. Write for Bulletin 10.

SCIENTIFIC QUARTZ-MERCURY ARC LAMP

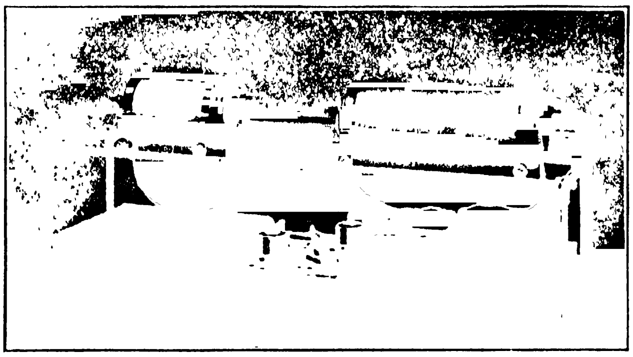


QUARTZ-MERCURY ARC LAMP

Scientifically designed and manufactured by practical experts, it is the most powerful source of intense ultra-violet rays and offers the best means of utilization in modern laboratory work. Physical, Chemical, Bacteriological and Physiological Laboratory Workers should be immensely interested in our descriptive Bulletin 20.

ELECTRIC COMBUSTION FURNACES

For organic analysis.



HANOVIA COMBUSTION FURNACE

This furnace is extensively used in scientific and technical laboratories. It is of unquestionable utility, a combination consisting of two mutually independent furnaces mounted on wheels. A grooved nickel support running thru both furnaces carries the combustion tube and prevents it from bending. Each furnace is provided with a separate rheostat, making possible accurate regulation of the temperature of combustion as well as the temperature of the copper oxide.

Their widespread use today is sufficient proof of their efficiency. Catalog on Muffle Furnaces, Tube Furnaces, Crucible Furnaces, etc., sent on request for Bulletin 15.

THE HART ROLLER BEARING CO.

Manufacturers of

The Hart Staggered Roller Bearing

559 MAIN STREET, ORANGE, N. J.

PRODUCTS

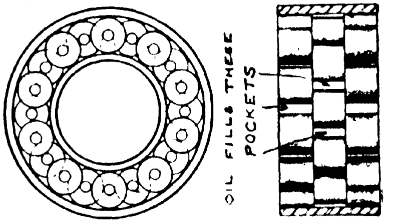
Hart Staggered Roller Bearings for all service.

SERVICE

Hart Engineering Staff is always at your service and will be pleased to make recommendations and assist in the solution of your bearing problems

PRINCIPLE OF THE HART STAGGERED ROLLER BEARING

The Hart STAGGERED Roller Bearing differs from conventional roller bearing design in that short staggered rolls are used, almost completely covering the raceways, thus

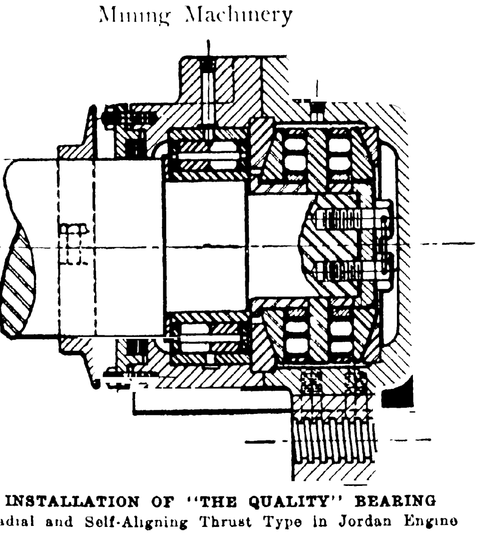


DETAIL OF CONSTRUCTION

Rolls and races are made of High Carbon High Chrome Steel, hardened and ground to precision standards. The rolls are mounted axially on steel pins which are riveted to steel cage rings, and the rings, pins and rolls constitute the roller assembly.

They are used in—

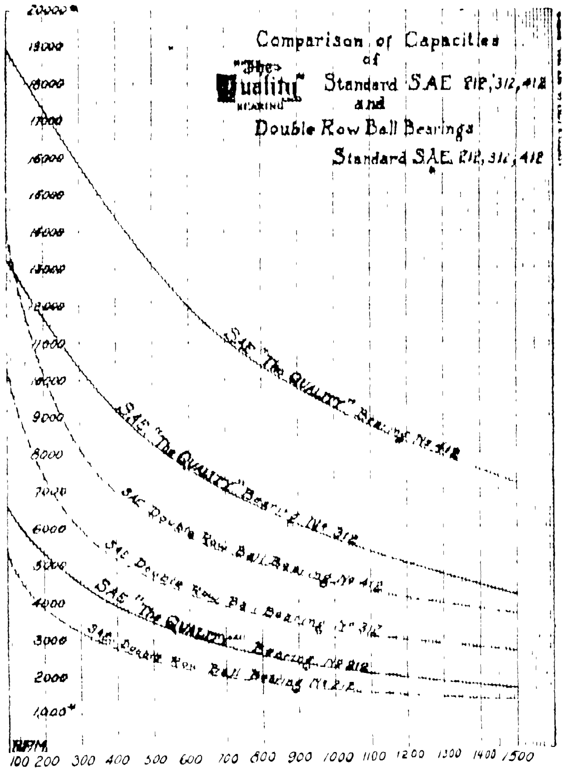
- Line Shafting and Jack-shafts
- Cranes
- Conveyors, Hoists and Winches
- Fans and Blowers
- Electric Motors
- Grinders and Pulverizers
- Industrial Cars
- Chemical Plant Machinery
- Textile Mill Machinery
- Paper Mill Machinery
- Tanning Machinery
- Farm Lighting Plants
- Rolling Mills for Steel, Copper, Rubber, and other Industries
- Mining Machinery



INSTALLATION OF "THE QUALITY" BEARING
Radial and Self-Aligning Thrust Type in Jordan Engine

ADVANTAGES OF STAGGERED ROLL CONSTRUCTION

The use of STAGGERED Rolls, made of High Carbon High Chrome Steel, with great accuracy of finish, results in an anti-friction roller bearing free from roller breakage, with superior lubricating ability and greater load carrying capacity than other types of bearings.



Therefore, the Hart STAGGERED Roller Bearing becomes "THE QUALITY" Bearing. Because of the long life, proper distribution of lubricant and great load carrying capacity "THE QUALITY" Bearing applied to machinery permits continuous operation, thereby INCREASING PRODUCTION.

Made in two types—one for carrying radial loads only, the other for thrust loads, "THE QUALITY" Bearing is a one function bearing.

"Do one thing at a time and do that Well."

Hart STAGGERED Roller Bearings do not require adjustment—they are fool-proof.

HARRISBURG PIPE AND PIPE BENDING CO.

HARRISBURG, PA.

PRODUCTS

Coils and Bends of all types made of Iron Pipe, Steel Pipe, Seamless Steel Tubing, Copper or Brass Tubing. Producers of Basic Open Hearth Steel. Manufacturers of Hollow Forgings, Billets, Hot Rolled Strip Steel, Narrow Universal Plates, Seamless Steel Cylinders for High Pressure Gases, Forged Seamless Steel Casing, Tubing, Line and Drill Couplings and Feed Water Heaters.

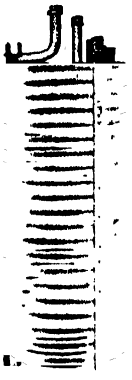
Designers and manufacturers of coils and bends for refrigeration plants, ice manufacturers, ice cream plants, hotels, distilling plants, packing houses, candy plants, cold storage, etc. Chemical Coils for Powder Works, Soap Plants, Oil Refiners, Paint Manufacturers, etc. Steam Heating Coils, Cooling Coils, Coils for Castings.

INTRODUCTION

Pipe Bending and Coil Manufacture is a highly specialized business. It is seldom that two orders are made alike and it is therefore impossible to give any more than a brief outline of the results we are able to accomplish. A few of the typical styles of coils are illustrated on this page to show the average demands made upon us.

COILS AND BENDS

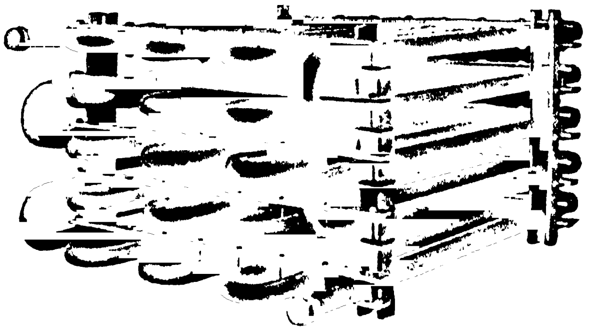
Harrisburg Pipe and Pipe Bending Company is a pioneer in this field. We have executed work for the leading chemical engineers of the country. Every Harrisburg Coil and Bend is thoroughly tested before leaving the plant and is guaranteed to rigidly meet the specifications of the order. Coils or Bends will be made by either Hot or Cold process, either with pipe supplied by the customer or purchased by us at his direction and specification. Our supremacy in the cold bending field is largely due to the special bending machinery, devised and perfected in our own shops.



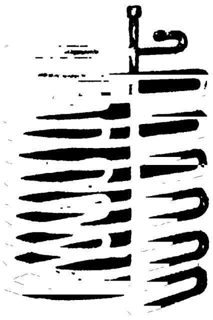
TYPICAL EXAMPLE OF DIFFICULT CYLINDRICAL COIL

Coils may be divided into the following general classes.

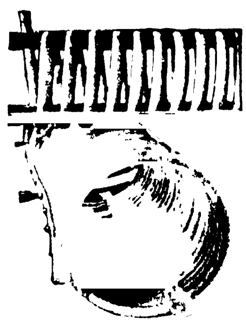
1. Flat Spiral Coils
2. Oval or Oblong Coils.
3. Cylindrical Coils
4. Helical Coils
5. Square or Box Coils.
6. Refrigeration Coils.



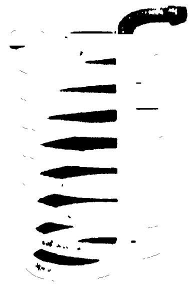
REFRIGERATION COIL



SPECIAL CYLINDRICAL COIL



FLAT COILS



SPECIAL REFRIGERATION COIL

SQUARE OR BOX COIL

STANDARD EXPANSION BEND

COILS FOR WATER HEATERS

We are making coils for gas and oil water heaters under contract with many manufacturers of such devices.

Our years of experience in handling work of this kind insure our customers a quality of workmanship difficult to obtain elsewhere. Our facilities are so large that we can render unusually prompt and efficient service.

In seeking quotations or in placing orders be sure to advise the kind of pipe and exact dimensions.

Continued on Next Page

COILS FOR WATER HEATERS

SEAMLESS STEEL CYLINDERS

Plants having occasion to receive and use such high pressure gases as oxygen, hydrogen, phosgene, anhydrous ammonia, chlorine, sulphur dioxide, liquefied petroleum gas, carbonic acid, nitrous oxide, etc., are naturally interested in handling such gases without possibility of accident due to defective containers.

SEAMLESS STEEL CYLINDER

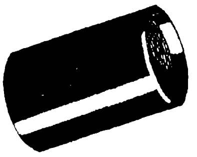
It will consequently be to the advantage of such plants to protect their own interests by insisting that the shippers of such high pressure gases use Harrisburg Seamless Steel Cylinders.

We have every reason to feel that the Harrisburg Cylinder is far superior to anything on the market. We were the first manufacturer to produce a heat treated cylinder. Our plate process insures against piping and leaking bottoms. Our Collars are forged steel, not malleable iron, and hence will not crack or break.

Harrisburg Cylinders conform to the I. C. C. specifications and undergo exhaustive tests by an Inspection Company. As Cylinders must be re-tested every five years, it is also important that a record of the steel analysis is on file with the Bureau of Explosives.

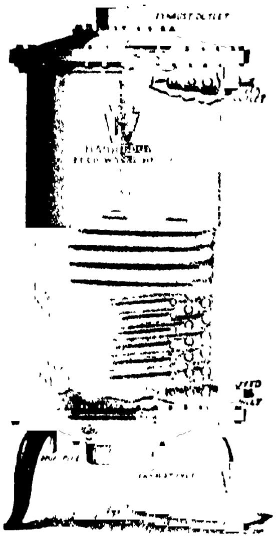
The Harrisburg name and trade-mark is clearly stamped on each cylinder. It will be to your protection and advantage to see that no other is furnished.

COUPLINGS



COUPLING

Harrisburg Forged Seamless Steel Casing, Tubing, Line and Drill Couplings cover all the conditions required for a perfect coupling regardless of the severity of the service conditions. Harrisburg Couplings will not go out of shape. Will not gall under the most severe strain. Have a perfect thread and perfect taper from the outer ends of the thread to the center. There is no portion of the thread length that will not engage the thread on the pipe. Made in sizes from 2 inches to 15½ inches. Booklet of tests mailed upon request.



FEED WATER HEATER

FEED WATER HEATERS

Will effect a noticeable economy in fuel cost by preheating the water before passing it into the boiler. It will also enable the plant engineer to get up steam quickly.

Made in either the Manifold or Box Type, of absolutely high grade material and workmanship throughout. The Harrisburg Feed Water Heater has been giving satisfactory service since its origination twenty-seven years ago.

FEATURES

Contains no joints inside of shell to leak.

Made of pure, seamless Copper Coils, brazed solidly to special gun-metal fittings, and supported with our improved clamp stays. All expansion and contraction is taken care of.

No back pressure on Engine, nor oil in boiler possible.

Will heat feed-water instantaneously to 206° to 212° F.

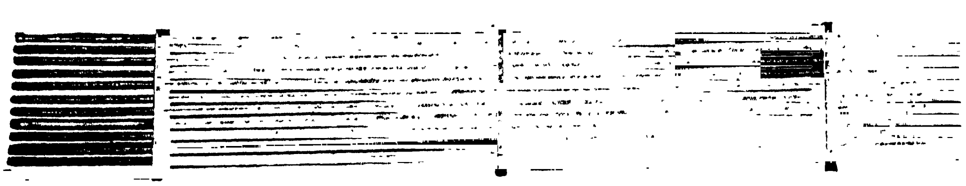
All coils tested to 600 pounds pressure. Cannot be burst by feed pump.

All water in contact only with copper tubing. Nothing to rust out.

No trouble from pumping hot water.

Guaranteed in every particular.

The most durable, effective, and economical Heater produced.



HEATING COILS

THE HART & HUTCHINSON COMPANY

Steel Lockers, Storalls Cabinets, Shelving, Toilet Partitions

NEW BRITAIN, CONN.

New York
501 Fifth Ave

Chicago
73 East Lake St

Philadelphia
Real Estate Trust Bldg

Boston
141 Milk St

PRODUCTS

Steel Lockers, Storalls Cabinets, Shelving, Toilet Partitions.

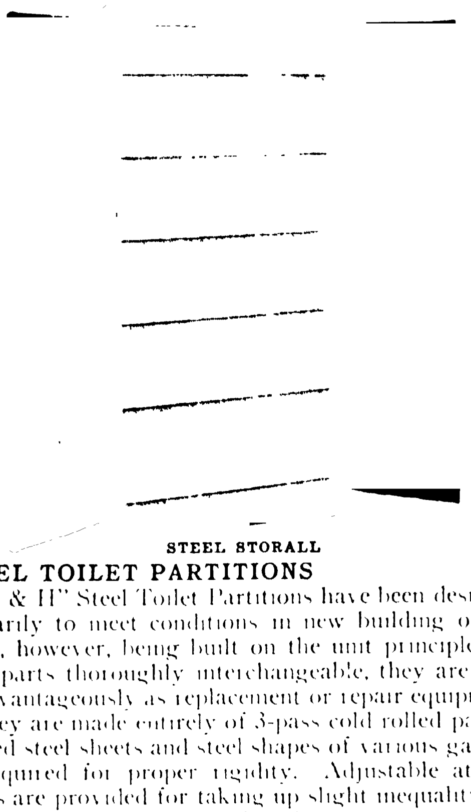
STEEL STORALLS

The "H & H" Steel Storalls offer to the Chemical Industries equipment for two branches, namely for offices for storage of books, records, cards, stationery and general supplies in a semi-fireproof cabinet. They also make an ideal equipment in the plant for storage of engineering data, sample specimens of various chemicals, master patterns, gauges, etc.

These can be had in the following sizes

36" wide 18" deep 72" high
36" wide, 24" deep, 72" high
36" wide, 24" deep, 18" high
24" wide, 18" deep, 24" high

Made with a secure but quickly adjusted shelf on 2" centers, capacity of shelf one hundred pounds per square foot, equipped with solid brass pin tumbler locks, two non rusting keys, finished in semi-gloss, olive green, oven-baked enamel.



STEEL STORALL

STEEL TOILET PARTITIONS

"H & H" Steel Toilet Partitions have been designed primarily to meet conditions in new building operations, however, being built on the unit principle and with parts thoroughly interchangeable, they are used as advantageously as replacement or repair equipment.

They are made entirely of 3-pass cold rolled patent-leveled steel sheets and steel shapes of various gauges, as required for proper rigidity. Adjustable attachments are provided for taking up slight inequalities of building walls or floors so that these partitions can be installed with very little labor by unskilled workmen.

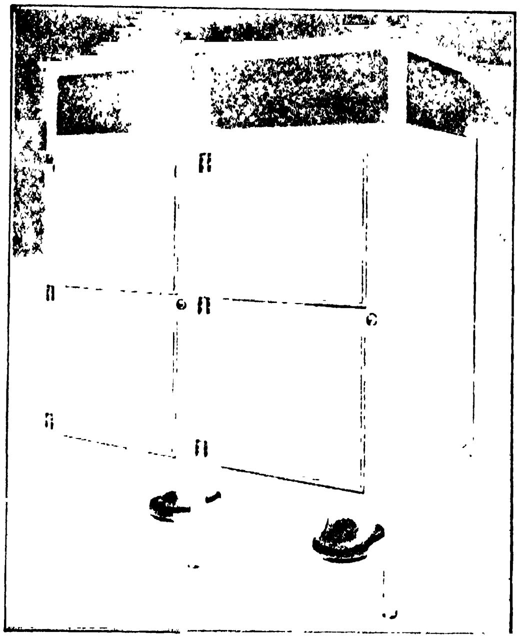
Doors are made with hollow stiles and rails, paneled on both sides of door, and are assembled by electric welding

The door pull is of neat design and the inside throw bolt is of an exceptionally heavy design

Hinges are of gravity design

Doors can be furnished with or without key locks

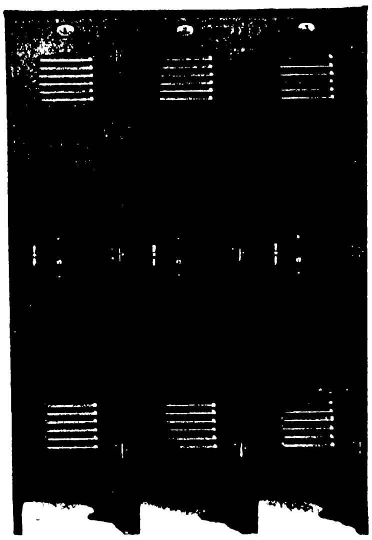
All "H & H" partitions are first thoroughly cleaned and then given a coat of mineral filler of special formula, baked on. They can then be finished with our standard olive green, or can be given the finished coat after installation, the filler coat being of good color for such treatment.



STEEL TOILET PARTITIONS

Shipment made from our factory or branches, knocked down and crated.

STEEL LOCKERS



STEEL LOCKERS

The "H & H" Steel Lockers for employees' clothing are accepted as standard for such work and are made of special construction employed by this Company only to insure thorough rigidity during the life of the locker and to make possible a strictly unit principle for erection They are equipped with solid brass pin-tumbler locks, or arranged for padlocks or combination locks, and can be supplied in a variety of sizes The standard color is olive-green baked enamel. Usually shipped knocked down with full instructions for erecting. Please forward your specifications or ask for variety of sizes we can supply.

THE HARTFORD TUBE PRODUCTS COMPANY

HARTFORD, CONN.

PRODUCTS

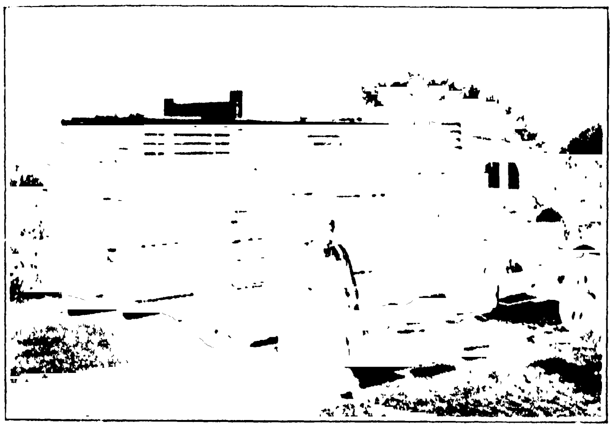
Fabricators of Pipe and Tube Coils of Iron, Steel, Copper and Brass.

Makers of Ammonia Receivers, Oil Separators, Accumulators, Gauge Tanks and other Welded Vessels for High Pressure Service.

Manufacturers of Steam Actuated Hot Water Storage Heaters.

PIPE COILS

We make coils for every purpose of heating and cooling. The design and size of coil in conjunction with the size of pipe or tube used, obtains practically any desired result in temperature exchange



BRINE COILS FOR REFRIGERATION

REFRIGERATING COILS

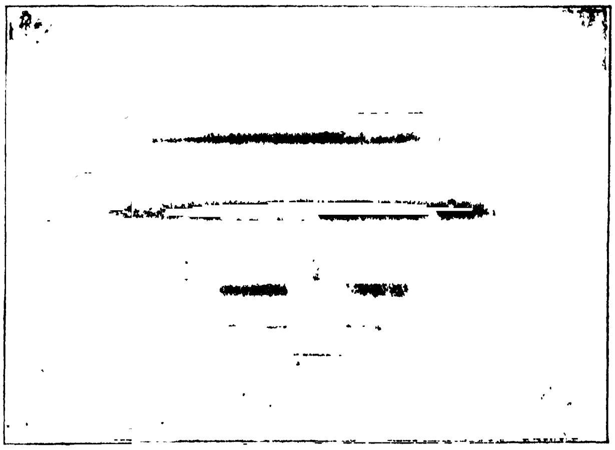
Electrically welded into continuous length, using wrought iron pipe for ammonia service in

- Condensers
- Absorbers
- Generators
- Heaters
  - For Isbell Porter
    - Carbondale and
    - similar Systems

Direct Expansion and Brine Coils for cold storage and hardening rooms, for installation on walls and ceilings, using steel or wrought iron as desired.

MISCELLANEOUS COILS

- Benzol Recovery Coils
- Transformer (Electric) Cooling Coils
- Pasteurizing Coils
- Acid Warming Coils
- Nitrator Coils
- Evaporator Coils
- Distilling Coils



AMMONIA RECEIVERS AND ACCUMULATORS

The welding (oxy-acetylene process) of ammonia receivers and other similar containers in which all joints are entirely eliminated is an all important feature of our production.

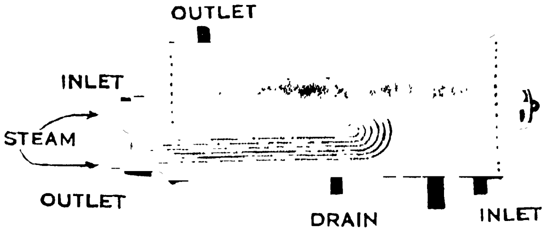
All welded products, likewise all coils, must withstand our hydraulic and air tests, which are purposely high that the interests of our clients may be protected.

Coils of copper and brass tubing, or pipe, are particularly suited to the needs of the chemical industry in a wide and diversified field of service. They are made in any design and subjected to our usual high test.

STORAGE HEATERS

Hot Water Storage Heaters are universally used in hotels, apartments, laundries, schools, Y. M. C. A.'s and hospitals In fact, every public building is now equipped with the convenience of hot water for all purposes, obtained from a heater installation in the basement, using exhaust steam as a source of heat transfer.

The requirements of large manufacturing concerns, particularly the textile industries, are similarly met with the use of a heater—employing either exhaust, or live steam, or both, as suited to individual needs.



STORAGE HEATER

THE HAUSER-STANDER TANK CO.

Manufacturers of Wooden Tanks for Every Purpose

Ammen Avenue and B. & O. R. R.

CINCINNATI, OHIO

PRODUCTS

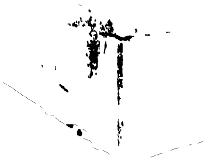
Wooden tanks, made to the special order of the customer, any shape or size, lead-lined or plain. No "in-stock" tanks carried at any time.

ADAPTABILITY TO DIFFERENT USES

Rectangular tanks are strongly bolted and braced, the nuts of vertical bolts are countersunk at the top, the holes being plugged up tight with wood plugs so that contents of the tank cannot come in contact with the metal rods

Malleable washers are used where nuts come in contact with the body of the tank Truss rods are used in tanks over 72 inches long. All iron rods fitted with cold pressed hexagon nuts Rods of brass, copper, galvanized or lead-covered material, supplied if specified.

Lead-lined tanks, with burnt-in joints, are impervious to acids and are used for hot oils, paints, glaze, acids, dyes, soaps, inks, metallurgical mill solutions, etc. Pressure in all cases is correctly determined by engineers, and the rodding and bracing we supply enable us to guarantee them against bulging or leaking



HAUSER-STANDER ACID AND PICKLING TANK

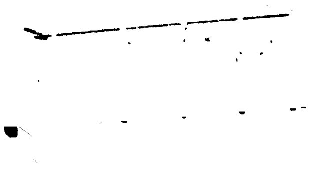
No metal exposed to tank contents

DURABILITY

Our catalog illustrates tanks that have been in continuous use from 25 to 40 years, and still are giving service that is satisfactory in every way

SIZES

Hauser-Stander tanks can be supplied in any shape, size, capacity or arrangement desired, in the following woods genuine Louisiana Red Gulf Cypress, Yellow Poplar, Southern Long Leaf Yellow Pine, Quartered or Plain White Oak, Northern White Pine and Oregon Fir.



RECTANGULAR TANK

MATERIAL

The lumber is the best that can be obtained converted into tanks by labor trained to make each tank mechanically correct.

We are always glad to offer our suggestions to concerns that do not know exactly what material is suited to their particular needs. Our experience in wooden tank construction covering a period of over half a century enables us to furnish information that is of inestimable value.

STANDARD TYPE HAUSER-STANDER ROUND TANK

Hooped to meet your requirements

USERS OF HAUSER-STANDER TANKS

That many of the largest chemical manufacturers use Hauser-Stander Tanks, constantly re-ordering as their needs grow larger, is proof positive that our tanks are satisfactory, as well as economical.

SERVICE

Your requirements receive the attention of experts when you turn the task of supplying your tanks over to us

The most suitable wood—

The best shape -

The necessary capacity.

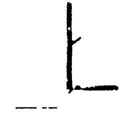
And when Hauser-Stander Tanks are installed, you know you can rely upon them for Satisfaction.

COOPERATIVE SERVICE

This Company maintains a department for cooperation with engineers and chemists in solving problems encountered in selecting and installing wooden tanks for acid and chemical solutions.

CATALOG

Our catalog, which contains much wooden tank and other information, will be mailed on request.



TANK WITH AGITATOR

THE HEIL COMPANY

Manufacturers of Welded Tanks for the Chemical Industries

1100-1200 MONTANA AVE., MILWAUKEE, WIS.

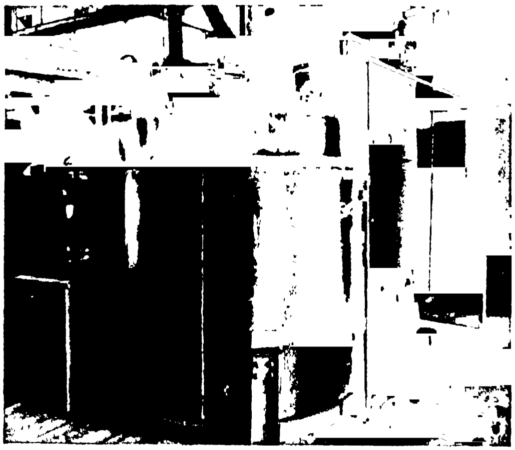
Motive Parts Corporation 136 West 55th St New York
The McKenna Company 1851 East 18th St Cleveland Ohio
[illegible] Northwestern Sales Co., Pelham and St Anthony Aves., St Paul, Minn
The Heil Company 2718-20 Wentworth Ave., Chicago Ill
The Modern Vehicle Co., 437-451 Fourth St., San Francisco, Calif
General Auto Truck Co., Virginia and 21st Sts., Washington, D C

PRODUCTS

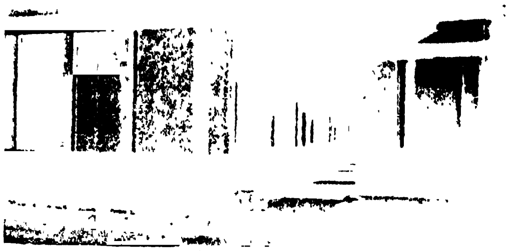
- Tanks for all purposes
- Gasoline Storage Tanks
- Air Receivers
- Rectangular Storage Tanks
- Standard Storage Tanks
- Steel Stacks
- Underground Gasoline Tanks
- Varnish Tanks
- Pneumatic Pressure Tanks
- Lead Lined Tanks

JACKETED STILL

This still is suitable either for steam heating or brine cooling. It is electric welded construction, which is recognized as superior to riveted steel plate work. With welded construction there are no rivets around which sediment can collect, thus permitting acid to destroy the material. Heil Tanks are all electrically welded.



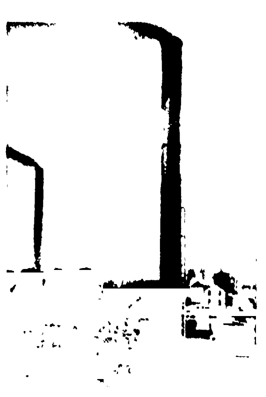
JACKETED STILL FOR NEWPORT CHEMICAL CO



VARNISH TANKS

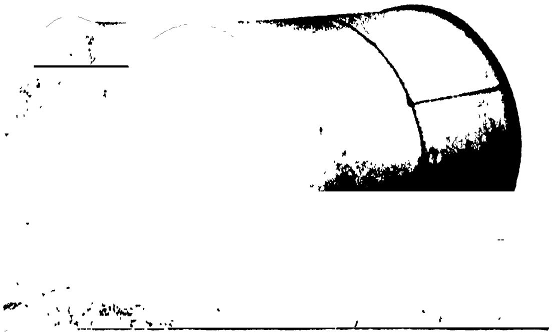
Typical Installation at the Patton Pitcairn Division—Pittsburg Plate Glass Co

FOUR MIXING TANKS WITH AGITATORS



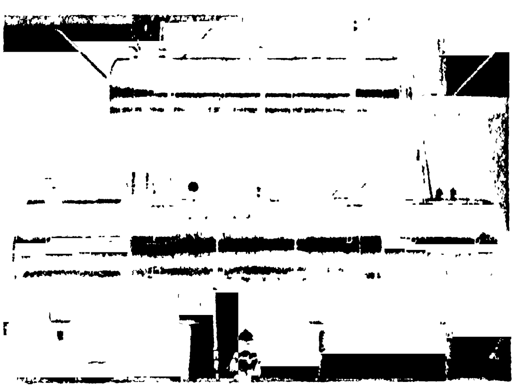
WELDED SMOKE STACKS

PRESSURE TANK



OPEN TOP TANKS USED BY NEWPORT CHEMICAL CO

HORIZONTAL STATION STORAGE TANKS



FOAMITE FIREFOAM ENGINE

Consists of Two Lead Lined Tanks

S. S. HEPWORTH COMPANY

Manufacturers of Centrifugal Machines

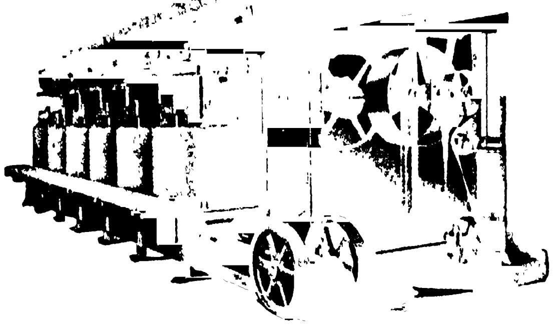
2 Rector Street
NEW YORK

PRODUCTS

Mackintosh Ball Bearing Centrifugals with Belt, Electric or Hydraulic Drive; Hoppers and Valves for charging Centrifugals; Mackintosh Unloaders; Vibratory Conveyors; Scroll Conveyors; Elevators.

MACKINTOSH CENTRIFUGALS

Mackintosh Centrifugals are furnished with every improvement that exacting test and long experience have been able to develop.



A BATTERY OF 6 MACKINTOSH BELT DRIVEN 40" CENTRIFUGALS

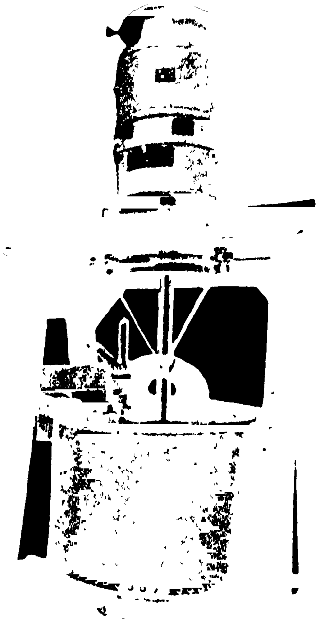
Brakes—Easy of access, self-locking, readily adjusted, quick acting. Separate brake drum prevents baking of belts.

Machines—Improved Weston type, self-steadying, without buffers, with a single easily accessible ball-bearing.

Friction Pulleys—Readily adjusted and without flying arms; do not bake the belts.

Idlers—Keep belts tight automatically, do not distort belts; arrangement for slacking off permits use of endless belts.

Baskets—Have large bottom openings permitting rapid discharge of contents.



ELECTRIC CENTRIFUGAL

Electric Drive—Mackintosh electrically driven centrifugals are provided with two speed motors. The high speed being suitable for drying materials and the lower speed automatically decreasing the torque of the friction clutch so that this torque balances the drag of the mechanical unloader maintaining the basket speed at a point suitable for unloading. This method of drive is patented in the United States and foreign countries.

MACKINTOSH UNLOADERS

Remove material rapidly from the baskets, thereby effecting great saving of time and labor. Easy on screens.

UNLOADER
For discharging dried material from centrifugal machine

HERRESHOFF FURNACE DEPARTMENT

of the
GENERAL CHEMICAL COMPANY
25 Broad Street
NEW YORK, N. Y.

of the
PACIFIC FOUNDRY COMPANY
18th and Harrison Streets
SAN FRANCISCO, CAL.

PRODUCTS

The New Herreshoff Furnace

for Roasting Ores
- (a) for the Manufacture of Acids
- (b) for Metallurgical Purposes.

for Calcining and Drying.

THE NEW HERRESHOFF FURNACE

In the roasting of ore the problem is to so manage the operation that as high a temperature as possible may be used at each step of the roasting, without at any time reaching conditions that cause fusion. By means of patented temperature control features incorporated in the **New Herreshoff Furnace** these temperature requirements, so essential to successful operation, can be efficiently maintained.

In the **Calcination** and **Drying** of materials where specific temperatures must be maintained for a given period of time, the **New Herreshoff Furnace** offers the advantage of economy of space economy of fuel: a large hearth area on which each particle of the material is exposed to the required temperature by means of specially designed rabbles and a simple and effective temperature control.

Air is used for cooling the **New Herreshoff Furnace** and its function is fourfold.

1st—It keeps the cast iron shaft and arms at a temperature where the metal possesses its maximum strength

2nd—It serves to regulate the temperature of the roasting process itself for, since it is a forced draught, it can be exactly controlled, and so regulated as to maintain a proper temperature inside the furnace.

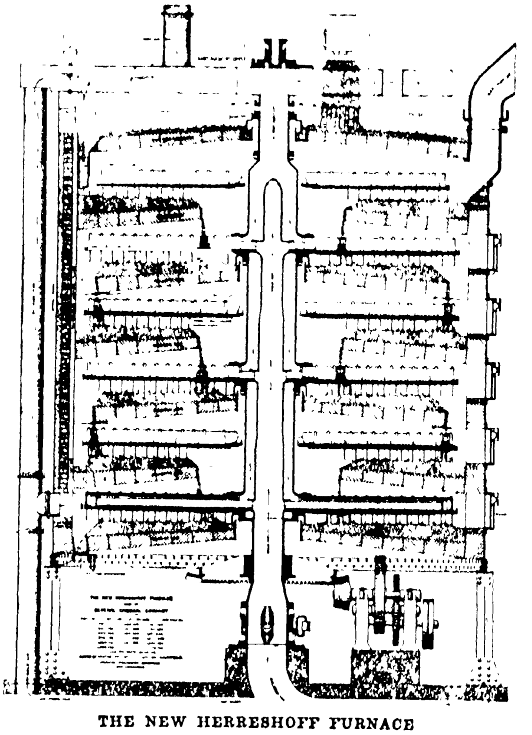
3rd—It permits the installation of temperature control flues, which absorb any excessive localized heat and transmit it to the cooler zones of the furnace

4th—It permits the utilization of waste heat for combustion, either with or without the use of extraneous fuel

CONSTRUCTION

The **New Herreshoff Furnace** has a cylindrical steel shell placed vertically, lined with red or fire brick, and in this shell brick hearths are placed horizontally one above the other Utilization of the top (or roof) of the first hearth has been made so that it acts as a pre-heater The ore drops from the hopper to this preheating hearth and is rabbled across it, thereby freeing itself of a great portion of its moisture content before entering the furnace. Passing down through the center of these hearths is a double vertical hollow shaft Attached to this shaft are one or two removable arms at each shelf, and replaceable rabbles, or teeth On the first hearth they are placed at such an angle that the revolving arms plow and turn the roasting ore over in a regular way, making it travel from the center of the hearth outward From there it discharges through proper openings onto the hearth below, where the teeth are placed at an opposite angle to the one above so as to turn and plow the ore from the outside toward the center of the furnace, where it again drops to the hearth below, as shown in the vertical section This operation is repeated until the ore finally discharges through an opening placed at the outer edge of the bottom hearth The rabble teeth are so arranged, in regard to their pitch and progression, that the movable ore body maintains a regular form of furrows equal in depth, from the center to the circumference on all hearths.

The life of the central shaft and arms, as well as the teeth, is prolonged by internal cooling. This cooling is accomplished by air, which is forced into the bottom of the shaft, as shown in the illustration, and then delivered through the central shaft, from which it passes in multiple at once into all the arms After cooling the arms and shaft the air is conveyed to the annular bustle pipe surmounting the vertical temperature flues, through which it passes to the bottom shelf, fulfilling a twofold purpose: first, the equalization of temperatures on the hearths, second, additional oxidation for combustion by the admixture of preheated air



THE NEW HERRESHOFF FURNACE

SIZES

The **Herreshoff Furnace** is built in diameters of 11′-7½″, 15′-9¾″, 18′-0″, 19′-6″, 21′-6″, with from 5 to 9 hearths as required. In addition a laboratory size has been developed for experimental purposes This has a diameter of 4′-6″ with 6 to 10 hearths as required.

USES

There were in 1921 over 2200 of various sizes of the **Herreshoff Furnace** in practical and economical operation in the following fields:

1- Roasting pyrites for manufacture of sulphuric acid
2—Roasting pyrites for manufacture of sulphite pulp.
3 Roasting pyrrhotite
4—Roasting of mixed sulphides for magnetic separation
5 Preliminary roasting of simple or complex sulphides for metallurgical work
6—Calcination of materials where specific temperatures must be maintained for a given period of time
7—Drying.

INQUIRIES

Each inquiry is treated as a special engineering problem.

HERCULES ENGINEERING CORPORATION

Special Chemical and Industrial Apparatus

Cable Address "HERENCO"

501 FIFTH AVENUE (42D STREET, NEW YORK, N. Y.

Telephones MURRAY HILL 8092 to 80

Monadnock Building Chicago

Excelsior Life Building Toronto

PRODUCTS

Evaporators, single and multiple effect.
CO_2 Generating and Liquefying Plants.
Chlorine Liquefying Plants.

Nitrators	**Condensers**	**De-alcoholizers**
Autoclaves	**Sulphonators**	**Solvent Recovery**
Acid Eggs	**Electrolytic Cells.**	**Gas Cylinders**
Preheaters	**Stills**	

SERVICE

The Hercules Engineering Corporation specializes in the production of chemical plant machinery of the most approved type. The rapid growth of the American chemical industry is partly due to the wide use of special equipment expressly designed for maximum yield per dollar of operating cost. Our organization includes chemical engineers with more than 20 years of experience in every branch of this industry, who study the requirements of each individual case and guarantee the satisfactory performance of their machinery.

EVAPORATORS

The properties of solutions vary to such an extent that it requires several types of evaporators to be able to handle each to best advantage. The Hercules Engineering Corporation has achieved gratifying success with the three types of evaporators described below. These have been perfected by the cooperation of our chemical engineers with our consulting engineer, Mr. Otto Mantius, one of the leading experts in this country on evaporator practise. While these designs are not new as to their basic construction, they have various features which make them especially attractive.

In all cases the heating surface is adequate, the steam properly distributed, a lively circulation of the liquor is induced to secure a high rate of heat transfer per square foot of surface, and arrangements made for the complete removal of air and noncondensible gases. The vapor body of each evaporator is so constructed that losses by entrainment or foaming are reduced to a minimum. All important parts contain enough metal to insure long life under hard service with low cost of upkeep. Auxiliary apparatus is either built according to our design or purchased according to our specifications from reliable manufacturers.

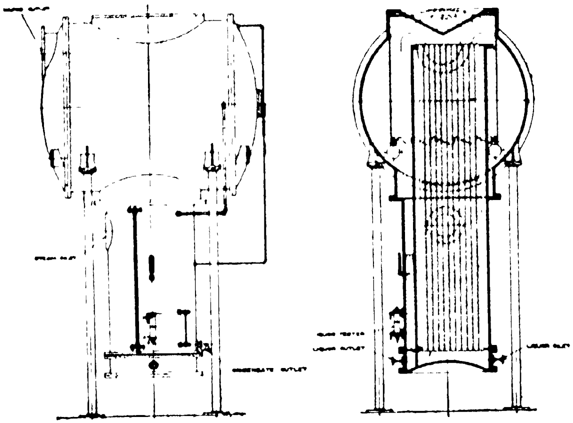


FIG. 1—72-IN. VERTICAL FILM TYPE EVAPORATOR SERIES S-101

Every installation is carefully engineered to insure a well balanced plant yielding a uniform product and maximum capacity with least difficulty. Instructions are given at all times how to operate the equipment to secure the highest possible efficiency. Such an installation is not likely to be the cheapest in first cost, but on account of high economy, ease of operation and low cost of upkeep, it will prove to be the cheapest in the long run.

HERCULES FILM TYPE EVAPORATORS

Theory and practise have shown conclusively that the film type of evaporator has not only the highest capacity per square foot of heating surface, but will also prevent practically all losses due to entrainment or foaming.

Fig. 1 illustrates a **Hercules Film Evaporator** of the vertical tube type. The apparatus consists of a horizontal cylindrical shell forming the vapor body, and a vertical cylindrical shell partly extending up into the vapor body, forming the steam chest.

Fig. 2 shows the assembly of a quadruple effect, Series 101, **Hercules Vertical Film Type Evaporator,**

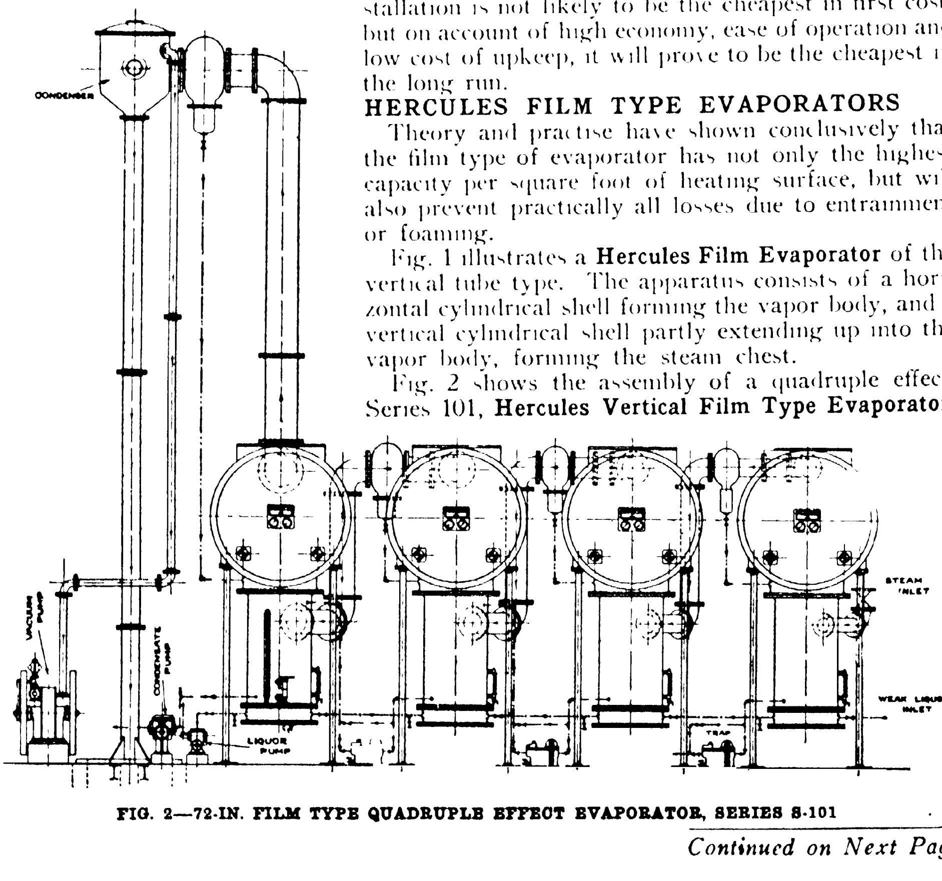


FIG. 2—72-IN. FILM TYPE QUADRUPLE EFFECT EVAPORATOR, SERIES S-101

Continued on Next Page

is 72 in. diameter. It will be noticed that the arrangement requires little floor space, and all pipe connections are very simple.

The Hercules Film Type Evaporator can be built of cast iron, copper, aluminum, also lead lined, in standard sizes containing 120 to 3000 square feet of heating surface in each effect, larger units being special. For fruit juices and food products, vapor belts can be built of enameled steel.

HERCULES VERTICAL TYPE EVAPORATORS

Fig. 3 shows a series 201 Hercules Vertical Type of Evaporator, in all-copper construction which is generally used for the concentration of tanning extract and other solutions containing organic acids.

Fig. 4 illustrates a second form of the Hercules Vertical Type Evaporator. Here the steam chest does not form an integral part of the evaporator shell but is of the floating or basket type, leaving a large annular downtake between the steam chest and the liquor belt. This type of evaporator is generally used for liquors from which salts separate during concentration, the wide area of the downtake and the large space in the cone bottom permitting a good separation of the precipitated salts.

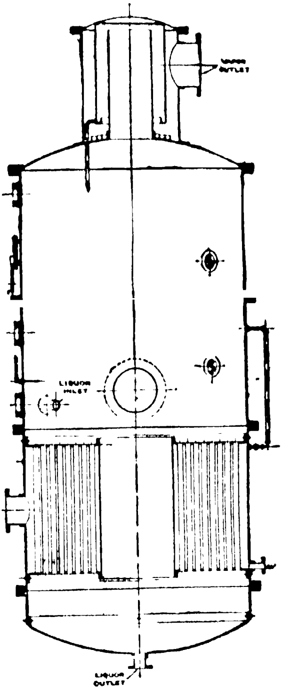


FIG. 3—84-IN. VERTICAL COPPER EVAPORATOR, SERIES S-201

Fig. 5 shows the arrangement of a 96-in. Series 202 **Hercules Vertical Double Effect Evaporator** complete with 60 in. diameter salt filters, dry condensing system, preheater and pumps, for the concentration of electrolytic caustic solutions. The vapor connections and liquor lines are very simple and so arranged that each effect can be shut off without interfering with the work in the other effects. The salts are discharged from the bottom outlet into salt filters as shown.

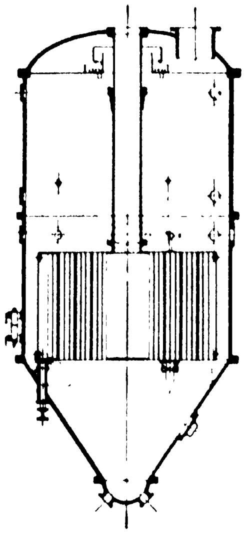


FIG. 4—96 IN VERTICAL EVAPORATOR, SERIES S-202

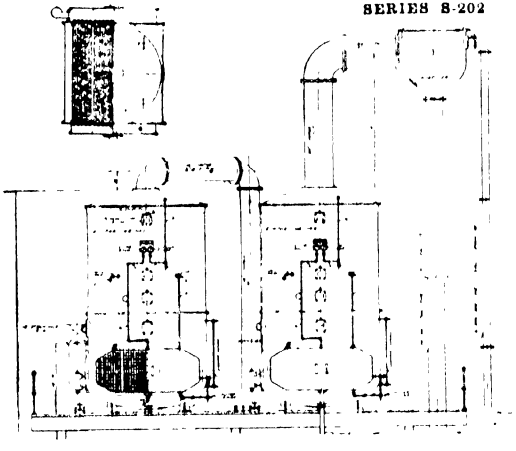


FIG. 6—GENERAL ARRANGEMENT 96-IN. DIAMETER HORIZONTAL DOUBLE EFFECT EVAPORATOR, TYPE S-304

FIG. 6A—INSERT SHOWS HORIZONTAL CROSS-SECTION THROUGH STEAM CHEST OF ONE EFFECT

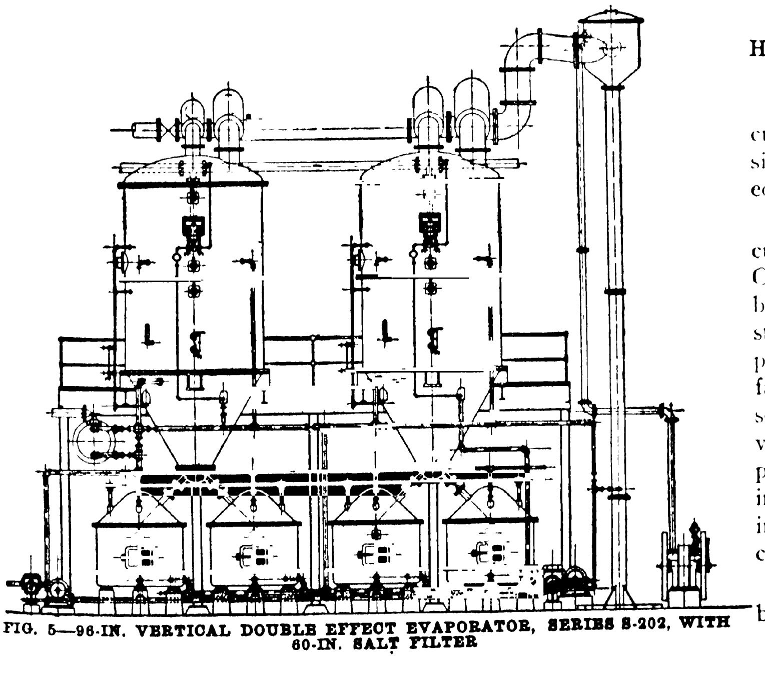


FIG. 5—96-IN. VERTICAL DOUBLE EFFECT EVAPORATOR, SERIES S-202, WITH 60-IN. SALT FILTER

HERCULES HORIZONTAL TYPE EVAPORATORS

Fig. 6 shows the construction of a Hercules Horizontal Type Evaporator designed especially for black liquor, but equally suitable for many other materials.

Fig. 7 represents another form of Hercules Horizontal Type Evaporator, the Oval shape, in which all flat surfaces are braced and anchored to prevent excessive strain or breakage from inside or outside pressure. The construction of the tube surface in this design is the same as that described for the Circular Type, but the vapor space is especially high in order to prevent losses by entrainment and foaming. As an additional safeguard we add, in severe cases, separate interior or exterior catch-alls or entrainment separators.

Both of these types of Evaporators can be built of cast iron, bronze, copper, steel

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or other metals The standard sizes contain heating surfaces from 250 to 2500 square feet in each effect.

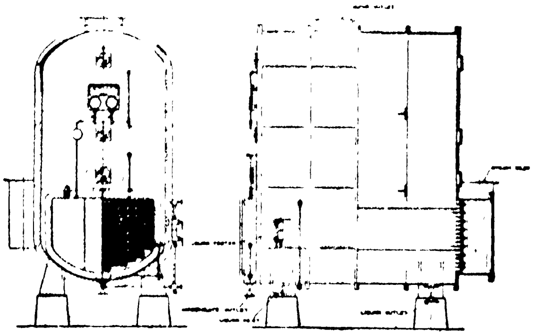

FIG. 7 60 IN OVAL EVAPORATOR, SERIES S-302

LIQUOR LEVEL REGULATOR

A uniform liquor level is essential in efficient evaporator operation We make two types, the first regulating the flow of the liquor entering the evaporator, the second controlling the outgoing liquor Both types consist of a large float and a butterfly or Corliss valve connected to the float lever, the construction being such that the level can be regulated within wide limits without interfering with the operation of the valve

The installation of such a regulator will pay for itself within a very short time, and it will give the operator a chance to do something more than to watch liquor levels.

LIQUOR TESTERS

The **Hercules Standard Liquor Tester** shown in Fig. 8 is simple, strong and compact, eliminating a number of joints and preventing leakage which frequently makes trouble in a standard design. It can be furnished in cast iron, bronze or monel metal, and all parts are easily cleaned and repaired.

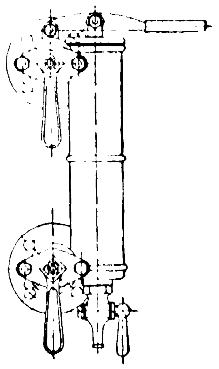

FIG 8—LIQUOR TESTER

HERCULES AUTOCLAVES

Hercules autoclaves include an ample factor of safety and are made of materials best suited for the service intended. We have many patterns, and are able to supply an autoclave exactly adapted to its work. Fig. 9 is a cross section and Fig. 10 an exterior view of Hercules Autoclaves. They are usually made of cast steel or our cast iron-steel mixture of high tensile strength and density. Our standard agitating mechanism (see Figs. 11 and 12), insures satisfactory service from a mechanical point of view. Jackets of cast iron or steel may be added to permit steam or hot oil heating.

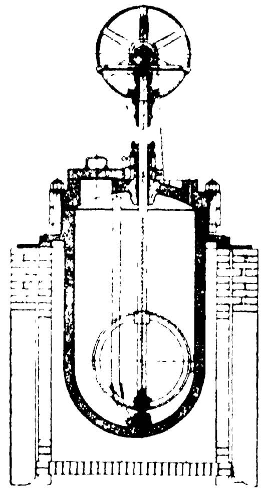

FIG 9—CROSS SECTION HERCULES AUTOCLAVE

FIG. 10—EXTERIOR HERCULES AUTOCLAVE

HERCULES NITRATORS

Built in capacities of 200 to 600 gal. Due to the use of hollow ribbed "cooling fingers" (see Fig. 11) in conjunction with jacket cooling, forced circulation of water, and effective agitation, the daily output of these nitrators is larger than in the case of other nitrators of like dimensions. Pot and cover are made of special acid-resisting cast iron, and extra strong

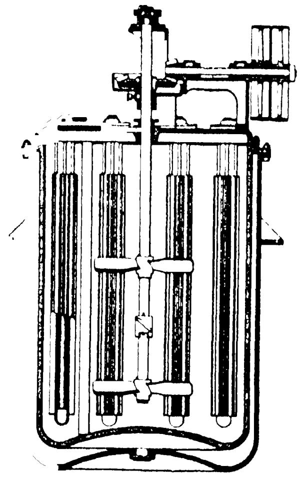

FIG. 11—HERCULES NITRATOR

HERCULES SULPHONATORS

See Fig. 12 Built of acid resisting cast iron. A well designed stirrer provides all needed agitation, and the steam heating jacket surrounds the entire body. Construction is heavy

STILLS AND SOLVENT RECOVERY

We design, build and operate fractional distilling equipment, for atmospheric or vacuum conditions, continuous or intermittent service, for many substances. Our engineers undertake the engineering and placing in operation of such plants.

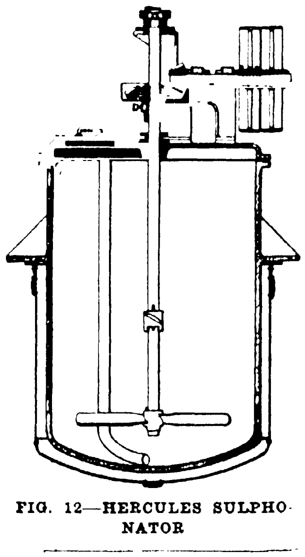

FIG. 12—HERCULES SULPHONATOR

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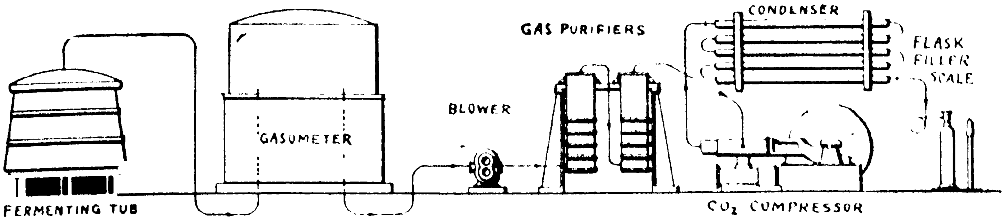


FIG. 13—CO_2 PLANT FERMENTATION PROCESS

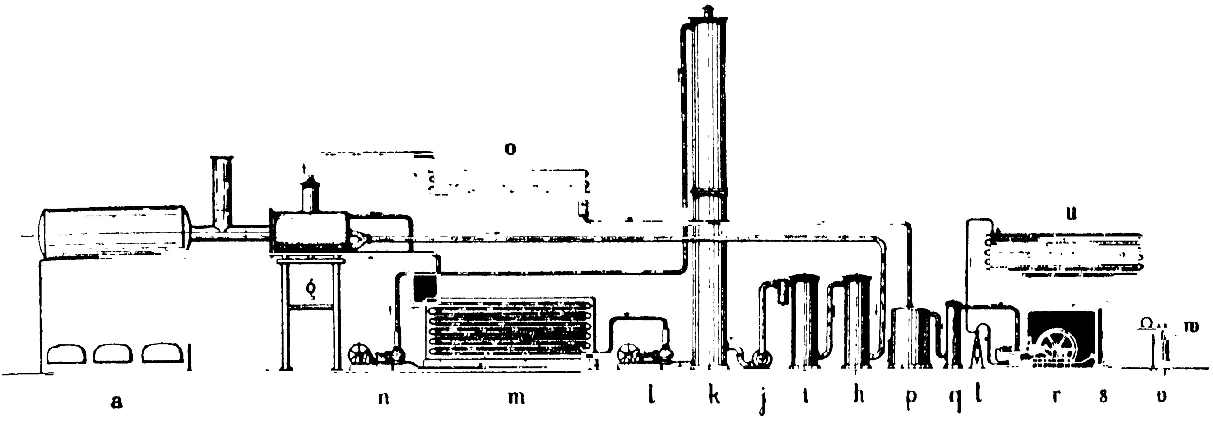


FIG 14 CO_2 PLANT COKE PROCESS

a Steam boiler g Lye boiler h Water washer i Soda washer j Blower k Absorption tower l Strong lye pump
Heat exchanger n- Weak lye pump o Carbonic acid cooler p Gas holder q Calcium chloride dryer CO_2 compressor
Charcoal filter t Separator u CO_2 condenser v Filler on scale w—Gas cylinder

CARBON DIOXIDE GENERATING AND LIQUEFYING PLANTS

100 to 1000 lb. per hour from coke, fermentation, and natural sources. Latest construction. Highest efficiency, and economy guaranteed.

We have recently completed one of the most economical CO_2 installations in the country which we would be glad to refer you to.

THE JEWELL CELL

Advantages
- Minimum floor space
- Maximum efficiency
- Tested and Tried
- Complete cell installations with Caustic Recovery

FIG. 15—JEWELL CELL
Eliminates all objectionable features Insures easy and safe operation

The Jewell ~~Chlorine~~ Regulating Devices will interest you. Write for information.

CHLORINE LIQUEFYING PLANTS—USING HERCULES CHLORINE COMPRESSOR

Operating on the combined high-pressure and low temperature process. Capacity 2 to 25 tons per 24 hours. Excellent results guaranteed. Design and workmanship based on 15 years' practical experience abroad and in the United States. These plants are low in upkeep and easy to operate. Expert instructors furnished to break in operating crew. We have installations that are producing constantly and at minimum operating cost—no refrigeration required.

STEEL CYLINDERS

Furnished for all compressed gases, such as oxygen, hydrogen, carbon dioxide and chlorine, supplied with or without our special valve. The Hercules cylinder valve, Fig. 18, reduces leakage and saves expense because only one valve will serve a number of cylinders, it being screwed into plug A, Fig. 16 when required (see Fig. 17). Strong, non-corrosive. Meets all safety and I. C. C. requirements.

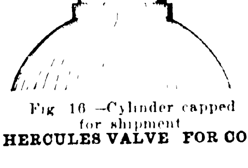


Fig 16—Cylinder capped for shipment

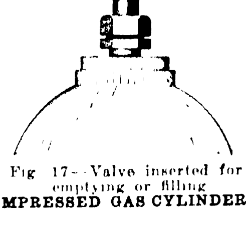


Fig 17—Valve inserted for emptying or filling

HERCULES VALVE FOR COMPRESSED GAS CYLINDER

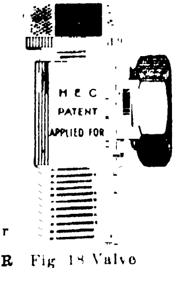


Fig 18 Valve

HIERGESELL BROTHERS

2007-9-11-13 Bellevue Ave.,
PHILADELPHIA, PA.
BRANCH OFFICE Los Angeles, Calif

PRODUCTS

Hiergesell Gas Absorption apparatus. Hydrometers. Scientific Glassware for Industrial and Research Laboratories. Thermometers. Thermo-hydrometers. Special Glassware.

HIERGESELL GAS ABSORPTION APPARATUS

For determining the gasoline content of still and natural gas

SCIENTIFIC GLASSWARE FOR INDUSTRIAL AND RESEARCH LABORATORIES

Scientific Glassblowing in all its branches. Conversion of glass into special apparatus to suit standard or individual requirements. Complete line of glassware carried in stock for immediate delivery. Special glassware made to order.

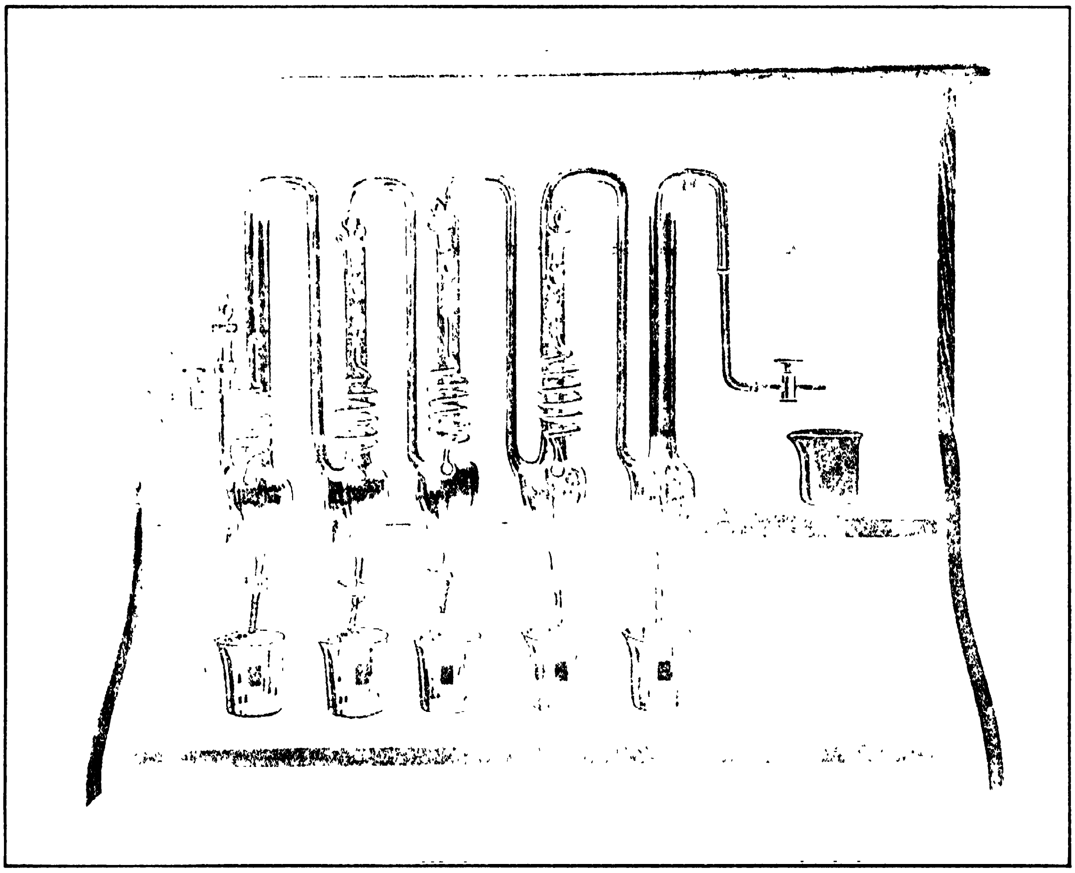
HYDROMETERS AND THERMO-HYDROMETERS

Hydrometers and Thermo-hydrometers arranged in series of sets for the chemist, with or without official or unofficial certificates. Graduated according to standards of adopted value for the inspection of petroleum and its products, milk, glue, acids, sugar spirits, etc. Our hydrometers are constructed to withstand breakage from ordinary handling and are capable of standing an accuracy check qualifying same for official precision stamp by the National Bureau of Standards. Private scale hydrometers made to order promptly.

Literature on request. Correspondence solicited.

THERMOMETERS

Plant and Laboratory thermometers of the indicating type covering a variety of uses, supplied with and without official and unofficial certificates. Long stem thermometers, Calorimetric, Cold Test, Maximum, Minimum, Chemical Test, Six's Self Registering, Thermostatic, etc.



HIERGESELL GAS ABSORPTION APPARATUS

THE HINDE & DAUCH PAPER COMPANY

255 WATER STREET, SANDUSKY, OHIO

SALES OFFICES

BALTIMORE
BOSTON
CHICAGO
CLEVELAND
DETROIT
MINNEAPOLIS
NEW YORK
PHILADELPHIA
PITTSBURGH
RICHMOND
ST. LOUIS
TOLEDO
TORONTO, ONTARIO

PRODUCTS

Corrugated Fibre Shipping Boxes, Bottle Wrappers and Packing Materials.

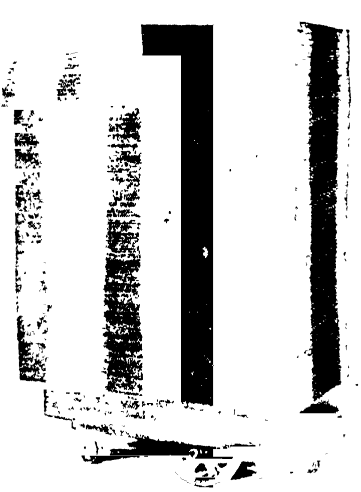
CORRUGATED FIBRE SHIPPING BOXES

Hinde & Dauch corrugated fibre boxes are made up of a layer of corrugated paper, each side of which is faced with a tough "jute" paper. This form of construction is especially adapted to withstand severe shocks and jars without injury to the contents of the package, and may be used for making shipments not exceeding 90 pounds gross weight. The construction is made to conform with the regulations governing shipments by freight, express or parcel post.

STANDARD CORRUGATED FIBRE BOX

H & D corrugated fibre boxes folded flat as here shown are compact and require the minimum amount of storage space in the shipping room until required for use. They are simple to set up, easy to close and stack. The use of these containers eliminates a large portion of the waste material and refuse found in most shipping departments.

The difference in weight as compared with wooden boxes effects a considerable saving in freight charges.



TRUCK LOAD OF FIBRE BOXES

The cellular construction not only prevents breakage, but also serves to protect the contents of the package from freezing or overheating.

The glued seal discourages petty thieving as it can not be readily reestablished without detection.

In addition to the advantages already mentioned the cost of corrugated fibre containers is much less than that of wooden boxes of corresponding capacity.

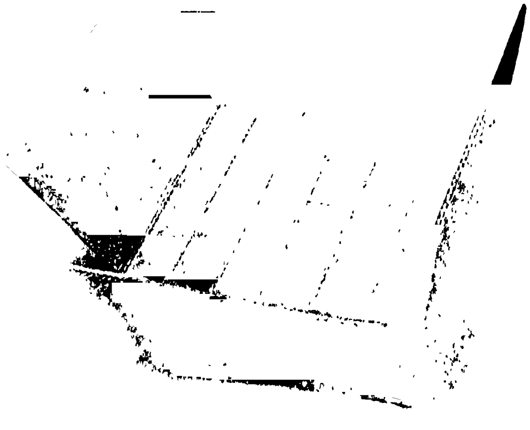
BOTTLE WRAPPERS

BOTTLE WRAPPER

H & D bottle wrappers and cartons, used for the further protection of liquids in glass, and of all fragile articles in shipment are also supplied in any size required. These prevent breakage from concussion of glass containers inside the shipping package. They are inexpensive, and easily adjusted to their contents.

PARTITIONS

Partitions are often used in H & D boxes to separate fragile articles which may form the units of the contents. They form separate compartments for the reception of the individual articles to be packed together in the same box, and enclose the contents of each cell.



BOX LINED AND PARTITIONS INSERTED

USE

The use of corrugated fibre containers is almost unlimited for shipping purposes as indicated by the character of the commodities mentioned in the following partial list, all of which may be transported satisfactorily in this manner

- Abrasives
- Acids, in glass or other containers
- Bottles, empty or filled
- Canned goods
- Chemicals, in other containers
- Drugs, bulk and in other containers
- Dyestuffs, in other containers
- Earthenware
- Eggs
- Fruits
- Glassware
- Hardware
- Herbs
- Jars, empty or filled
- Laboratory supplies
- Lamp globes and shades
- Macaroni
- Ore samples
- Paper goods
- Porcelainware
- Roots
- Rubber goods
- Soap
- Starch
- Textiles
- Tobacco
- Umbrellas
- Woodenware

HIRSCH-CRAWFORD COMPANY

200 HARTMAN BLDG., COLUMBUS, OHIO
SOLE AGENTS FOR THE UNITED STATES AND ITS POSSESSIONS OF
THE CLEVELAND BREATHING MACHINE COMPANY
Cleveland, Ohio

PRODUCTS

Lyon Breathing Machine and Infant Breathing Machine.

"Everything in Safety for Safety."

THE LYON BREATHING MACHINE

This machine is a device that is instantly available in cases of poisoning from Gases, Ammonia, Fumes, Mine Accidents, Drowning, Electric Shock, Collapse from Anaesthesia, Asphyxia of the New-born, etc. It requires no corrections or alterations, giving pure air under safe pressures, able to dislodge foreign matter from the mouth, nasal cavities and bronchial tubes, delivering same into the open air (or receptacle) in a satisfactory manner.

It is endorsed and in actual service by the Gas Defense Branch of the Chemical Warfare Division of the United States Government, which is the highest possible endorsement that can be given any instrument.

Having met the exacting demand of this Department it should be made a part of the Safety equipment of every Chemical plant.

Since saving life in emergency is a matter of seconds this device comes ready set up for operation, and requires no time in attaching tubes and face masks. This often means either success or failure.

The Lyon Breathing Machine is the only device of its kind on the market which can be sterilized.

The Lyon Breathing Machine is made entirely of aluminum, will not corrode, rust or tarnish. It is light and strong, guaranteed against imperfections in construction, workmanship and material, and will last a lifetime. Simple directions accompany each outfit.

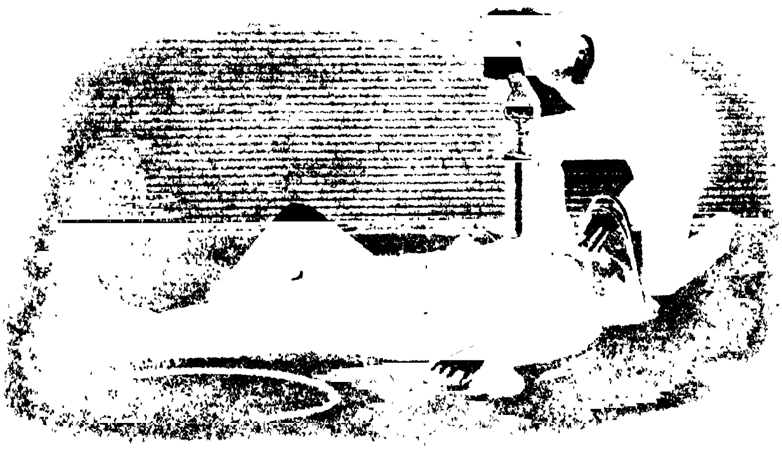
This device is further provided with an oxygen connection whereby varying quantities may be given from any type of container.

THE INFANT BREATHING MACHINE

To supply popular demand an Infant Breathing Machine for use on babies at birth has been added to our line.

PARTIAL LIST OF THOUSANDS OF USERS

Armour & Co.,
American LaFrance Fire Engine Co.,
Champion Coated Paper Company,
Cleveland Railway Co.,
City of Cleveland,
Cincinnati General Hospital,
Chemical War Service U. S. Government, Gas Defense Branch,
Dayton Eng. Laboratories Co.,
Ford Motor Company,
Hydraulic Pressed Steel Co.,
J. H. Foster, President Hydraulic Steel Co. (Private Grounds),
McKinney Steel Company,
Procter & Gamble Co.,
Pyrene Manufacturing Co.,
St. John's Hospital,
York Haven Paper Co.



LYON BREATHING MACHINE IN ACTUAL USE

HOAGLAND-THAYER, INC.

Storage Battery Industrial Electric Trucks

300 WASHINGTON STREET, NEWARK, N. J.

PRODUCT

The Hoagland-Thayer Industrial Electric Motor Truck.

ELECTRIC WAREHOUSE TRUCKS

This type of material handling equipment is becoming more and more popular with those responsible for manufacturing costs.

Their flexibility of movement and load capacity enable them to reduce trucking costs which affect the ultimate cost of manufacture

One Industrial Electric Truck will displace several hand trucks At the same time it will make more trips over a given distance, carrying at least four times the load each single trip.

These trucks can go anywhere, across roadways, up grades steeper than a laborer can push or pull a hand truck, along cobble paved roadways

A laborer of ordinary intelligence can operate one of these trucks after a few hours' practise

THE HOAGLAND-THAYER TRUCK

The most advanced practise in the use of electric power and the best engineering skill available, coupled with experience in operation, are all combined in the design and development of the Hoagland-Thayer Truck.

It is dependable, built for hard service, and will carry a load of 4,000 pounds

The power is supplied by storage batteries and transmitted by front axle drive

The Truck when light has a speed of from seven to eight miles, when loaded from five to six miles per hour, and will negotiate from 5 to 10% grades with full load

The Truck is always under easy control and can be driven with equal facility either forward or reverse at slow, medium or high speeds, and turns in the smallest possible radius, steering by all four wheels.

The steel frame gives rigidity with the least possible weight The axle construction permits the highest power efficiency and eliminates the use of sprockets and chain drive, which have a tendency to take up and enmesh any loose material which may be strewn over the line of travel.

The Trucks are built according to standards adopted by the Electric Vehicle Association of America.

The Truck can be readily dismantled. All parts are easily accessible.

The best workmanship and materials are used throughout.

Specifications, Type "A" Truck

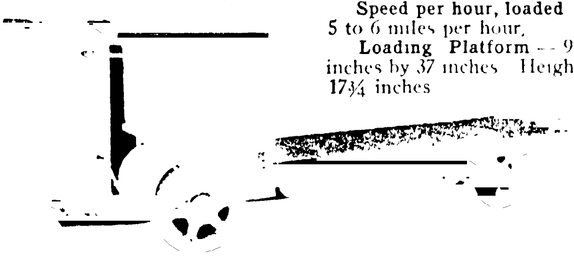
Loading Capacity—4,000 pounds.

Weight of Truck—2,085 pounds complete with battery.

Speed per hour, light—7 to 8 miles per hour.

Speed per hour, loaded - 5 to 6 miles per hour.

Loading Platform - - 94 inches by 37 inches Height 17¾ inches



TYPE A TRUCK

Length Over Body 10 feet exclusive of operator's foot board

Turning Radius 10 feet outside wheels

Tread, Front 34 inches

Tread, Rear 26 inches

Wheel Base 78 inches

Tires, Front 20 inches by 3½ inches Goodrich Solid Base

Tires, Rear 15 inches by 3½ inches Goodrich Solid Base

Battery 21 Cells A 6 Edison Suspended on Springs, eliminating shock

Motor 24 Volt, 40 Ampere, 1050 R P M, Motor, specially designed for vehicle service and Storage Batteries Will take 150 amperes, 24 volts, for ten minutes without overheating This high overload capacity permits high starting power and full load on reasonably heavy grades

Controller Has three speeds forward and reverse with positive stop, automatic neutral and return check and can be used without resistance

Brake -Royal Duplex on intermediate shaft The driving gears are always locked when not in operation as the brake is automatically applied when the operator steps from the pedal

Charging Plug E V A Standard, 50 ampere, of the removable safety type

Steering Four wheel horizontal lever control, giving the smallest turning radius possible

Transmission Double reduction spur gearing with full floating axle, the weight of the car carried on housings eliminates all strains on axles except those incidental to driving Brown Lipe differential with 3½% nickel steel gears and universal connection to driving wheels, completely enclosed and thoroughly dust and waterproof Gears and differential running in oil

Frame--Structural steel, hot riveted and thoroughly braced

Platform Floor Hard wood

Wheels, Axles, Knuckles Cast Steel

Bearings Anti friction throughout (Annular Ball)

Intermediate Shaft 1⅜ inches Nickel Steel

Driving Shaft 1⅜ inches Nickel Steel

Oiling All moving parts equipped with oilers

Painting To suit Buyer

Operation—In starting, the position of the motorman should be with the right hand on steering arm, the left on controller lever. The right foot on brake pedal.

To start, press pedal down, this releases brake and closes electrical circuit to controller which governs the power transmission Then move controller lever downward for forward, and upward for reverse motion, holding at speed desired First notch either way for slow, second medium, and third high speed Releasing brings it to neutral, and cuts out current automatically

Move steering arm in the desired direction, either right or left

To stop, release Controller lever first, then raise foot from the pedal The Controller lever returns to neutral as soon as the hand is removed

Caution—Reversing the Controller lever while truck is in motion produces severe strain on mechanism, and should be avoided.

For emergency stops remove foot from pedal This simultaneously shuts off the power and throws on the brake automatically.

If for any reason the motorman leaves the footboard the truck will automatically stop, as the pedal lever when released applies the maximum brake and cuts out the electric current.

Charging Cost—With a Public Service plant, giving 110 volts D. C., the current for charging the batteries for one truck would be from 25 to 35 Kilo Watt hours, at an average price of 4c. per K.W. hour, the cost would amount to from $1.00 to $1.40 per charge With the use of a motor generator or rectifier this cost would be reduced one-half, as the loss incurred by the rheostat resistance would be avoided.

Established 1865 Incorporated [illegible]

THE HODGE BOILER WORKS

Steam Boilers and Steel Plate Construction

EAST BOSTON, MASS.

PRODUCTS

Horizontal Return Tubular and Vertical Fire Tube Boilers; Locomotive and Marine Type Internally Fired Boilers.

Storage and Pressure Tanks of all types.

Steel Smokestacks, Smoke Flues and Standpipes.

Steel Plate Construction and Sheet Iron Work.

Vulcanizers, Digesters and Rendering Tanks.

FACILITIES

Equipment—Our plant is fully equipped with modern tools and labor saving devices required for the economical fabrication of steam boilers and all forms of steel plate construction.

Experience—With over fifty-five years' experience in steel plate construction, we are able to guarantee intelligent execution of any work of this character. Many of our employees have devoted their lives to the service of this company and are unusually skilled mechanics, insuring the highest quality of workmanship to our patrons.

Shipments—The material required for the construction of standard horizontal return tubular and vertical boilers is carried in stock, as well as completed boilers of the sizes most frequently desired, making it possible for us to fill all orders promptly and in many cases to make immediate delivery.

TANKS AND STEEL PLATE WORK

We build all types of tanks required for the chemical industries, such as digesters, vulcanizers, rendering tanks, soaking-out and storage tanks.

The location of our factory on the water front of Boston Harbor makes it possible for us to deliver, in completed form, tanks larger than can be handled conveniently as all rail shipments.

HORIZONTAL RETURN TUBULAR BOILERS

Externally Fired Type—Boilers of the ordinary externally fired type are constructed for any desired working steam pressure in accordance with specifications to fulfil the requirements of the A.S.M.E. Boiler Code, the Massachusetts State Law or any local requirements.

These boilers are built in standard sizes ranging from 20 h.p. to 300 h.p., and are ordinarily furnished complete with the necessary fixtures and castings, including safety valve, steam gage and combination water column. (Piping for the fixtures not furnished unless specified.) Also binder bars, arch bars, cast iron fronts and stationary grates as required for the complete installation of the boiler.

If desired and specified, we are prepared to furnish the necessary framework and supports for the suspended form of setting.

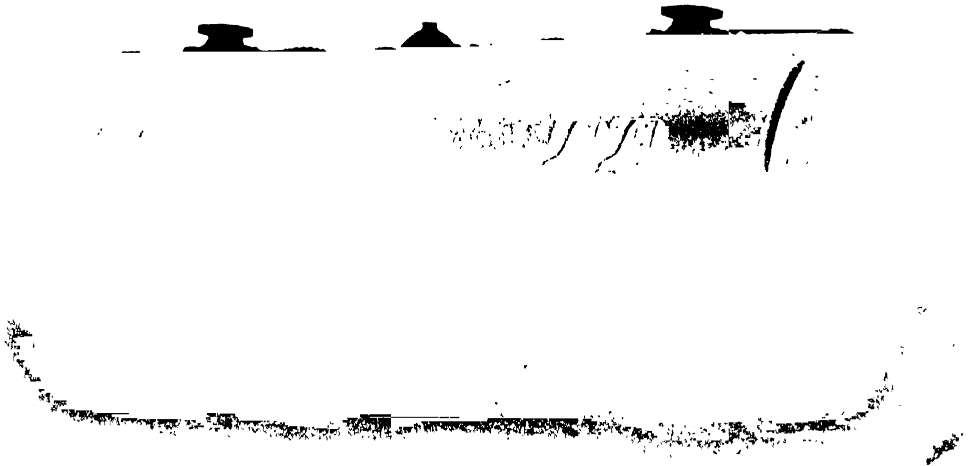
Castings for setting the boiler with either flush or vulcanizing front will be furnished as desired.

If required, we will furnish a complete set of drawings showing all the details regarding the setting for any particular case.

Internally Fired Type—We are prepared to furnish and recommend boilers of the internally fired horizontal return tubular type, with corrugated furnaces, for installations where the overload conditions are excessive or otherwise detrimental to the use of a brick set boiler.

Boilers of this type are particularly adapted for high pressure and possess all of the merits of Scotch Marine Boilers. The space required is also somewhat less than for boilers of the externally fired type.

These boilers can be furnished in sizes ranging from 50 h.p. to 300 h.p.



HORIZONTAL RETURN TUBULAR BOILER

HODGES WATER STILL COMPANY, INC.

5713 Appletree St.
PHILADELPHIA, PA.

PRODUCTS

Water Stills, single effect and multiple effect; Salt Water Stills.

HODGES SINGLE EFFECT STILLS

Made in 5 sizes, producing 5, 10, 15, 30 and 50 gallons of distilled water per hour. Specially adapted for laboratory work. Employed largely in storage batteries, and electrolytic preparation of oxygen and hydrogen.

HODGES TWO EFFECT STILLS

In following sizes—75, 125, 225, 300, 500, 1000 and 2000 gallons of distilled water per hour. Will produce 3400 gallons of distilled water per ton of coal with modern boiler. Corresponding production from fuel oil according to quality.

HODGES MULTIPLE STILLS

An extension of the two-effect principle to 3, 4 and 6 effects by the addition of condensing units. With each added effect an increasing amount of secondary steam is generated within the Still, economizing in size of boiler and amount of fuel. In a 3 effect Still one ton of coal will produce 4600 gallons of distilled water, in conjunction with a modern boiler; in a 4 effect 6800 gallons. A higher number of effects will economize correspondingly in fuel and boiler size.

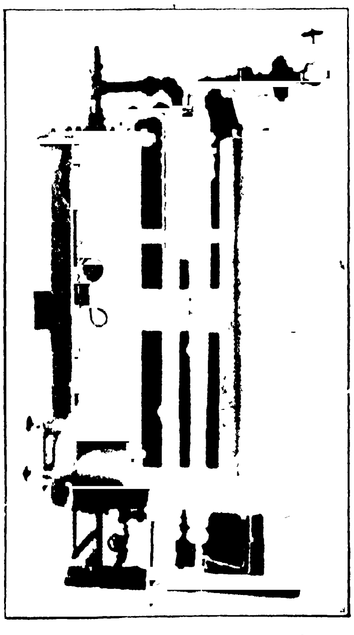
Hodges Stills operate with Live Steam direct from a boiler. The Still does not include a boiler, which is supplied by the purchaser.

AUTOMATIC OPERATION

The intake of steam is automatically regulated by a steam-reducing valve, and the water by a water-trap. These being once set, the Still takes care of itself, requiring only to have valves opened and closed when starting or stopping.

CLEANING

The removal of scale from the outside of condenser tubes is easily effected, as the tubes are straight and can be reached in place with an ordinary tube cleaner by lifting off the top cover.



HODGES SINGLE EFFECT STILL

QUALITY OF DISTILLED WATER

Distilled water from a Hodges Still is entirely free from organic matter, living or dead. Mineral residue (lime, magnesia, chlorine, etc.) below two parts per million. Iron removed without trace. The constitution of the raw water does not matter, the distilled water having the same purity in all cases.

PALATABILITY OF WATER

Perfectly distilled water is tasteless. The smoky taste of ordinary distilled water is due to the so-called "gases of distillation" which come over with the steam from the boiler. All raw water contains organic matter, some of which vaporizes at a lower temperature than steam and the vapor mingles with the steam. By the Hodges Patented Process the steam is re-condensed into distilled water at a temperature above the condensation point of these gases, which are piped off into the atmosphere, leaving a product as palatable as spring water.

NO AERATION

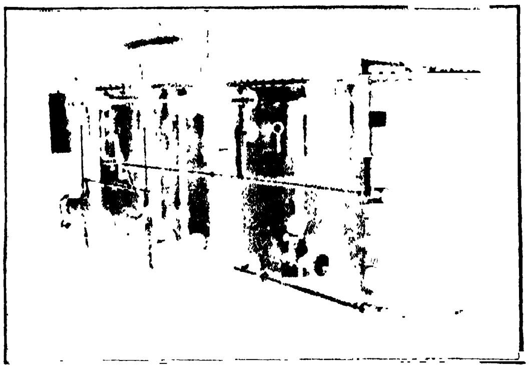
No aeration is employed in the Hodges Still to correct the taste of the water, no such correction being necessary. The distilled water is rigidly protected from all contact with air, and is consequently free from air—the most troublesome of impurities—and the other impurities which air contains.

GUARANTEES

The purity and palatability of the distilled water and the capacity of the Still as rated are guaranteed.

LITERATURE

General Catalog. Bulletins on Ice Manufacture. Bulletin on Vending of Distilled Water. List of Representative Users. Any of these furnished on application.



TYPICAL HODGES TWO EFFECT STILL

ANTON HOFFMANN, INC.

Manufacturer of Wooden Tanks, Vats and Drums

311-317 E. 91st Street
NEW YORK, N. Y.

PRODUCTS

Wooden Tanks, Vats and Drums in any Shape for any Purpose.

Round
Oval
Square
Rectangular

Single Tier
Multiple Tier
Partitioned
Special Shaped

Agitator Tanks
Pickling Tanks
Platers' Tanks
Pressure Tanks

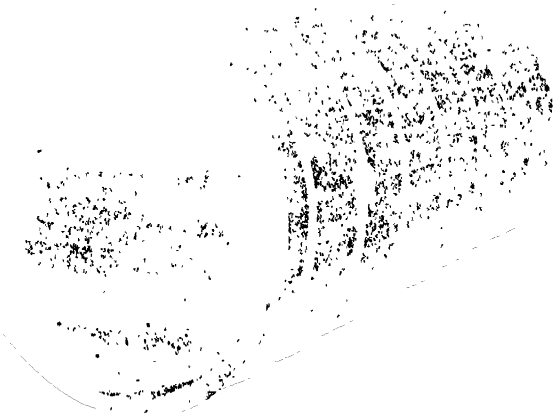
Platers' Polishing Drums
Photographers' Tanks
Filter Tanks
X-ray Tanks

Fur Dyeing Tanks and Drums

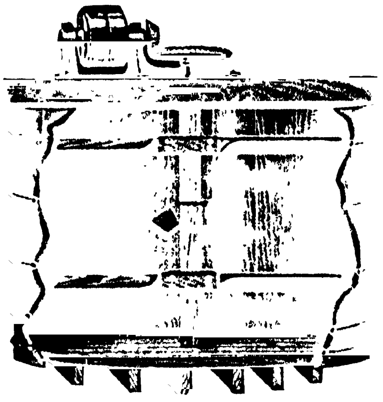
For

Chemical Plants
Bleacheries
Dye Houses
Tanneries
House Tanks

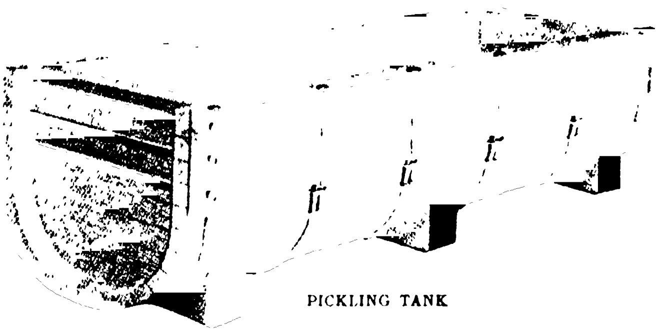
Color and Dye Manufacturers
Paint and Varnish Works
Pulp and Paper Mills
Beverage Manufacturers
Sprinkler Systems



PRESSURE TANK



AGITATOR TANK



PICKLING TANK

HOFFMANN SERVICE

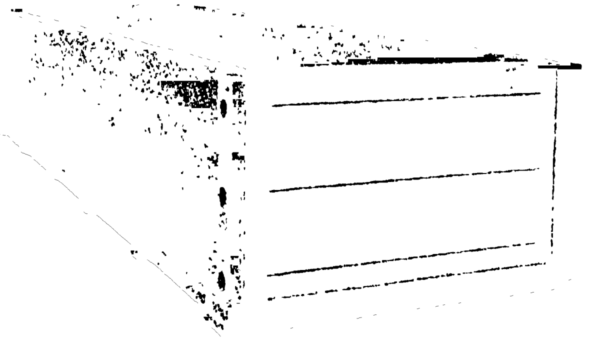
Our many years of experience in constructing tanks, vats and drums enables us to fulfill the requirements of the chemical and allied industries

Long life is built into each tank or drum through the use of carefully selected, well seasoned wood, a large stock of which is always carried, thereby insuring prompt deliveries

All work is done by competent, experienced men in accordance with the best modern practice When specifications as to material, bracing, fitting, etc, are given by customer, they are followed explicitly All orders receive prompt and careful attention

Each tank is built as though it were a "special", this means special tanks Vats or drums can be built to order within a reasonably short time

When in need of tanks or drums Hoffmann Service is worthy of your careful consideration Inquiries will receive prompt attention



REGULATION RECTANGULAR TANK

HOHMANN-NELSON COMPANY

Manufacturing Engineers

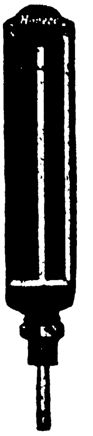
EAU CLAIRE, WIS., U. S. A.

TRADE Honeco MARK

PRODUCTS

Thermometers for Industrial, Engineering, Laboratory and Chemical requirements; Recording Thermometers; Automatic Controllers, Airless and Air-operated types, for Temperature Pressure, Vacuum, Time and Condensate discharge; Thermo Steam Traps.

HONECO INDUSTRIAL THERMOMETERS


"HONECO" INDUSTRIAL THERMOMETER

The Mercurial Thermometers, so universally employed in all manufacturing and engineering operations, have been identified with the name "Hohmann" ever since their introduction, and the Honeco are the ultimate perfection of over 35 years of Thermometer development and progress, and are still manufactured under the direction of A B Hohmann, the man who originated them

They are made in the various forms and sizes, that are now standard, provided with the fittings, attachments and features, that make them applicable for every possible requirement, and of scale ranges, from minus 40° to plus 1000° F, or equivalent

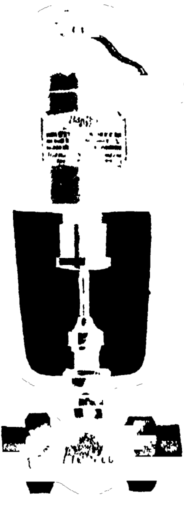
RECORDING THERMOMETERS

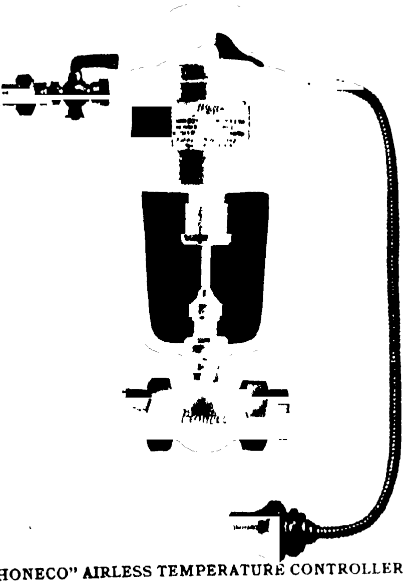
Vapor tension and mercury actuated types, of self-contained and long distance forms, with various ranges, fittings, attachments and features for all requirements

HONECO AIRLESS CONTROLLERS

A Nelson creation, made only for controlling temperature and pressure, requiring no auxiliary motive power for operation, and the only self-contained Controllers that for many applications closely rival the air and water operated types, in ease and accuracy of adjustment, and closeness of control

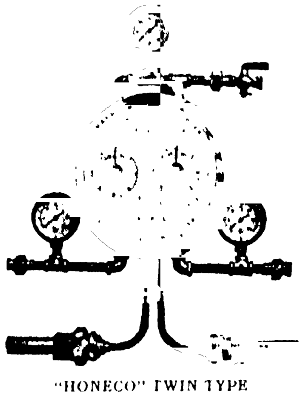
The operating ranges of the Temperature Controller are from plus 40° to plus 650° F, and the Pressure Controller from 1 to 150 pounds


"HONECO" AIRLESS PRESSURE CONTROLLER


"HONECO" AIRLESS TEMPERATURE CONTROLLER

HONECO AIR-OPERATED CONTROLLERS

Another Nelson invention, the distinctive feature of which is the valve in adjusting screw, accessible and removable from the front of the case without disturbing any connections, eliminating air valve and adjustment troubles and insuring operation that surpasses all previous performance of air operated Controllers, for continuous satisfactory service


"HONECO" TWIN TYPE AIR OPERATED TEMPERATURE CONTROLLER

These Controllers, in conjunction with Diaphragm Motor Valves as shown below, are made for controlling Temperature, Pressure, and Vacuum, the operating ranges of which are respectively Minus 40 to plus 750° F - the fraction of a pound to 400 pounds per square inch ¼ to 30 inches of mercury

Also made for Time and Condensate Control, the former for automatically shutting off the heating or cooling medium, blowing off steam, admitting cooling water, ringing or lighting a signal, at the expiration of any time period for which the Controller is set, and the latter for discharging condensate, wet steam, and air, from steam apparatus, at any temperature or pressure, performing this service far more effectively than any steam trap.

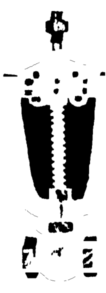
HONECO THERMO STEAM TRAP

Simple and compact and performs a service not possible with float and bucket type traps

"HONECO" THERMO STEAM TRAP

Has only one moving part, which is the powerful, indestructible and unchangeable motor, which operates without stress, strain or wear, on the unfailing thermal principle of expansion and contraction, effectively draining apparatus, coils, etc, of all condensation, wet steam and air, thereby insuring highest heating efficiency and also uniformity of temperature in steam heated spaces

Suitable for pressures to 100 pounds, adjustable for any temperature to 350° F. and provided with valve opening of the same capacity as inlet and outlet


DIAPHRAGM MOTOR VALVE

LUDWIG HOMMEL & CO.

Electric Appliances and Machinery

GENERAL OFFICES

530-534 FERNANDO STREET, PITTSBURGH, PA.

PRODUCTS

Silverman Illuminator for Microscopes.

DESCRIPTION

The Silverman Illuminator is intended for use in microscopic examinations and for photographing opaque and semi opaque objects It consists in principle of a circular source of light surrounding the objective and furnishing a diffused and uniform illumination directly on the spot to be examined

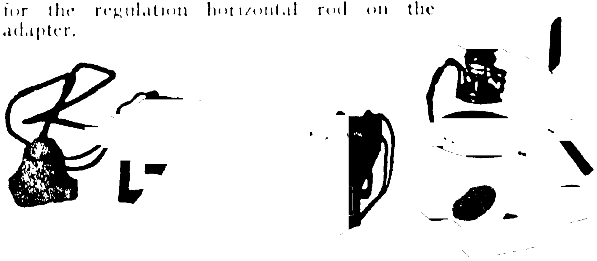
In practice the circular source of light takes the form of a small, circular tube, electric lamp held in place around the objective by means of a holder, the proper current being supplied from the electric lighting circuit through a rheostat Dry cells or a storage battery can also be used

The illumination is derived from a tungsten lamp taking about 9 ampere at 13 5 volts for visual observation work and focusing, while during photographic exposure 1 06 amperes at 18 volts is applied through a rheostat suitably arranged The lamp is made in plain (colorless) glass and daylight (blue) glass

Stage Adapter For certain work it is desirable to keep the illuminator in a fixed position The stage adapter accomplishes this purpose In the study of fatigue failures, slip bands, cleavage planes, etc , oblique rays are essential, and it is better to keep the light down low instead of having it moving up and down with the objective The stage adapter is useful here as well as in low magnification work in which the objective is at a considerable distance from the specimen.

One very important application of the stage adapter lies in its use with the double objective type binocular microscope

When it is desired to lower the illuminator into a hollow object and keep it stationary in a fixed position, the bent rod is exchanged for the regulation horizontal rod on the adapter.



SILVERMAN ILLUMINATOR

Shutter—The shutter may be slipped into place inside and under the lamp Its purpose is to cut off the light from about one-half of the light source, causing shadows to be cast by surface elevations of the specimen

Absorption Disk This is a specially made blackened brass disk with hole in center, intended to be laid on specimen, especially for low power work It will prevent reflection of light into the microscope tube except from the spot under observation

SPECIAL CHARACTERISTICS

The Silverman Illuminator can be attached to any microscope, ready for service, in a few moments. The tedious relative adjustment of microscope and light source is eliminated.

It supplies a soft, steady light, free from glare Owing to the diffusion of the light, a wealth of detail is visible Eye fatigue is eliminated.

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Absence of Shadows—Its light is evenly distributed and shadows largely eliminated This is valuable in the study of rough surfaced specimens If desired, the shadows can be produced by the use of the shutter

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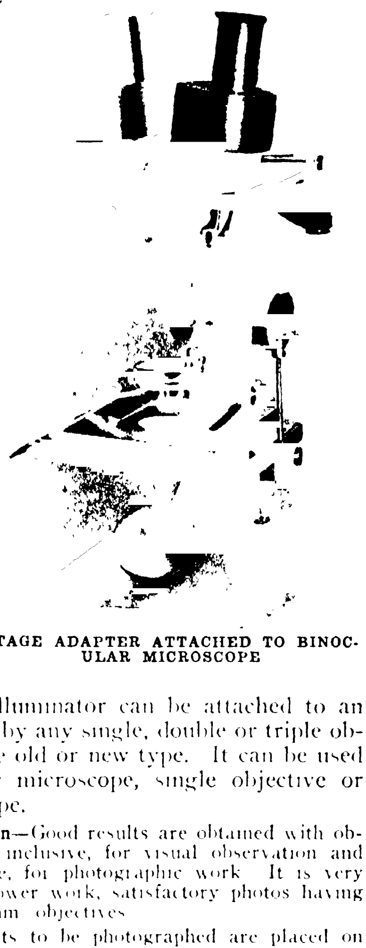

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Photography—Objects to be photographed are placed on the stage in the usual way The light intensity and quality are such that a camera without shutter or lenses may be attached to the tube of the microscope. With a 10X eye piece and 16 mm or 32 mm objective, an exposure of 20 seconds is usually ample

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Metallography
Mineralogy
Plant Pathology
Biology
Pharmacy
Botany
Steel and Iron
Brasses and Bronzes
Textiles
Paper
Rubber
Leather
Wood (effect of stains, etc)
Linoleum Compositions
Vitreous Enamels
Refractories
Glass
Abrasives
Insulating Materials
Fibroid

HOHMANN-NELSON COMPANY

Manufacturing Engineers

EAU CLAIRE, WIS., U. S. A.

TRADE **Honeco** MARK

PRODUCTS

Thermometers for Industrial, Engineering, Laboratory and Chemical requirements; Recording Thermometers; Automatic Controllers, Airless and Air-operated types, for Temperature Pressure, Vacuum, Time and Condensate discharge; Thermo Steam Traps.

HONECO INDUSTRIAL THERMOMETERS

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They are made in the various forms and sizes, that are now standard, provided with the fittings, attachments and features, that make them applicable for every possible requirement, and of scale ranges, from minus 40° to plus 1000° F , or equivalent

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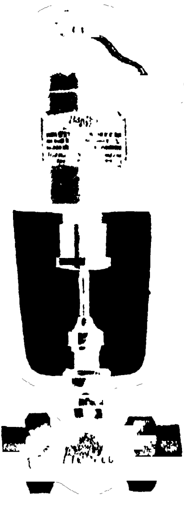

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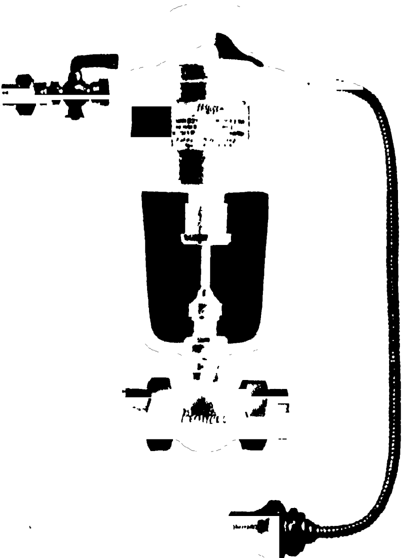

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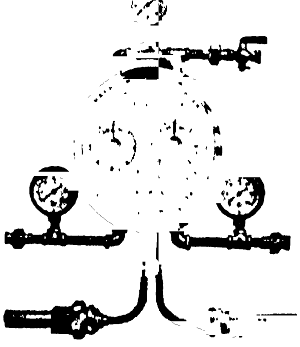

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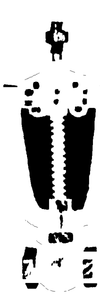

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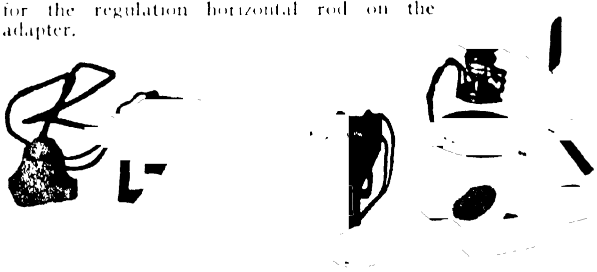

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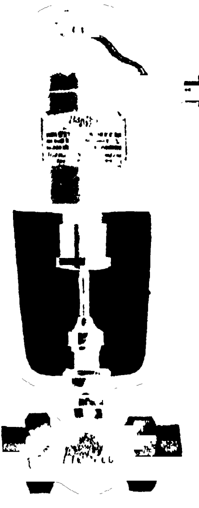
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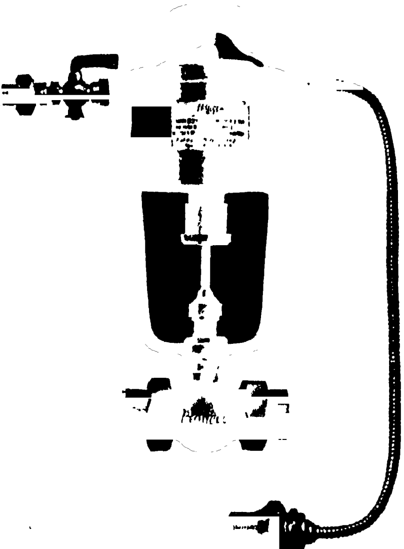
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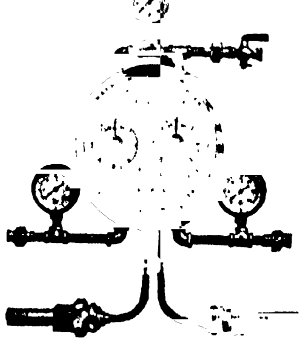
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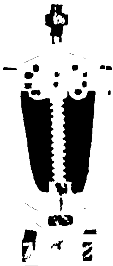

DIAPHRAGM MOTOR VALVE

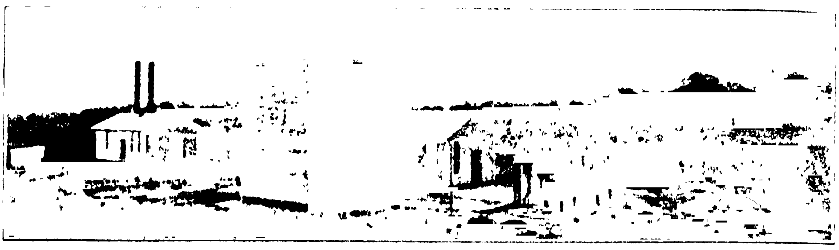
HOPE ENGINEERING AND SUPPLY COMPANY

Consulting and Contracting Engineers

Pittsburgh Pa MT. VERNON, OHIO Tulsa, Okla

PRODUCTS AND SERVICES

- Gas and Oil Engines
- Air and Gas Compressors
- Pipe Couplings for Threadless Pipe
- Heat Exchangers
- Absorbers
- Absorption Gasoline Plants
- Compression Gasoline Plants
- Oil and Gas Pipe Lines
- Power Plants
- Pumping Stations
- Compressing Plants
- Engineering Reports (Petroleum and Natural Gas)
- Gas Testing
- Gas Analysis



ABSORPTION PLANT FOR RECOVERY OF GASOLINE FROM NATURAL GAS

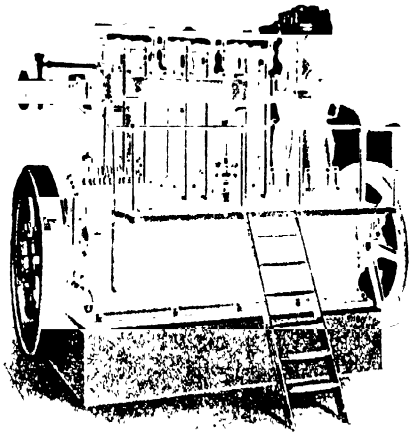
REEVES GAS ENGINES

Vertical, multi-cylinder, four cycle type

These engines are built for use of Natural, Artificial or Producer Gas as well as Oil or Gasoline They are highly efficient, closely regulated Power Producers with an unexcelled record for continuous service In addition to the above qualities, the small floor space required and quiet running offer great advantages for driving generators in Office Buildings.

REEVES COMPRESSORS

Are of the Vertical, Multi-cylinder type constructed in combination with the Gas, Oil or Steam Engine, having Power and Compressing Cylinders on the same bed, or as separate Compressor Units suited for short belt drive. All valves are of the Biplane Type and Cylinders designed for one stage or two stage compression



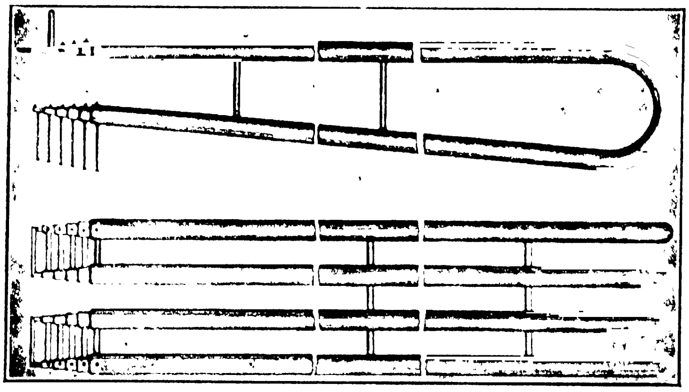
REEVES DIRECT CONNECTED GAS OR OIL ENGINE COMPRESSOR

HEAT EXCHANGERS AND OIL COOLERS

Heat Exchanger shown herewith has the following advantages over all other types:

High Velocity, as well as thin narrow streams of fluid

Complete insulation in itself without necessity of special insulating material



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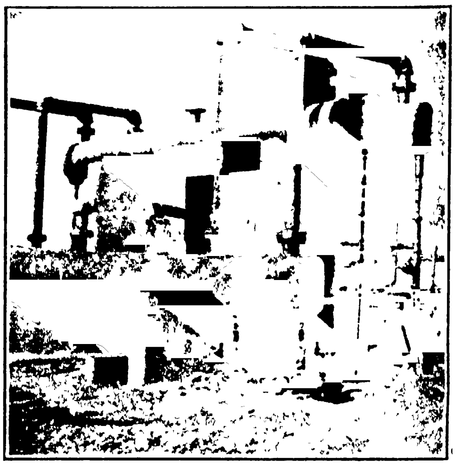

ABSORBERS
Two sets of absorbers (in series) in gasoline extraction plant

HOHMANN-NELSON COMPANY

Manufacturing Engineers

EAU CLAIRE, WIS., U. S. A.

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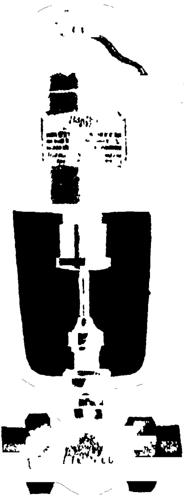
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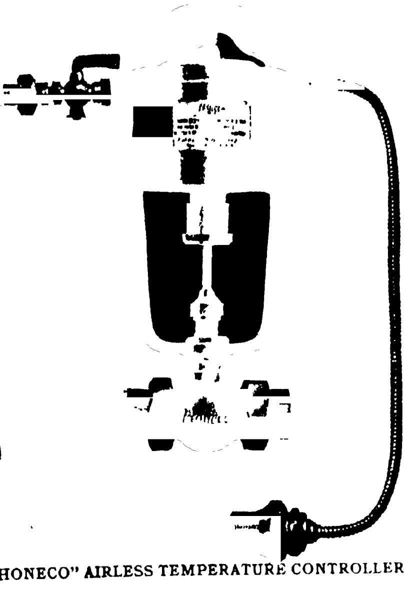
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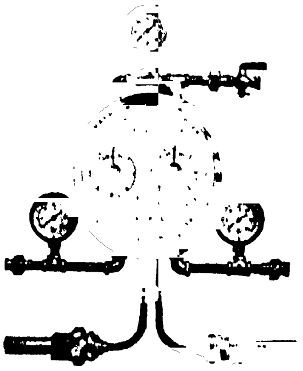
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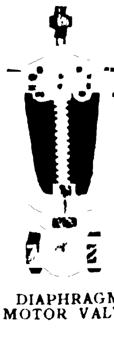
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HOSKINS MANUFACTURING COMPANY

Chromel

1155 Lawton Avenue
DETROIT, MICHIGAN

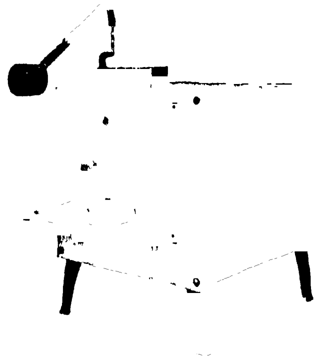
HOSKINS

CHICAGO	CLEVELAND	BOSTON	NEW YORK	PITTSBURGH	SAN FRANCISCO
Otis Bldg	Sloan Bldg	Tremont Bldg	Grand Central Terminal	Oliver Bldg	Sheldon Bldg

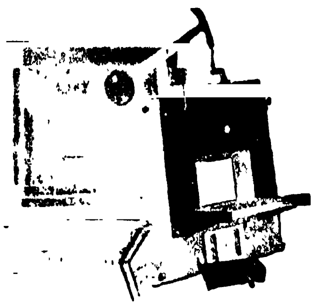
PRODUCTS

- Electric Laboratory Furnaces
- Tool Furnaces
- Hot Plates
- Pyrometers
- Thermo—Couple Wire and Protecting Tubes

FURNACES



TYPE FD-204 MUFFLE FURNACE



KNOCK-DOWN OF MUFFLE FURNACE TYPE FD-204

Type FD—This furnace is featured by the fact that **no part of it need be returned to the factory when repairs are needed.** On practically all sizes no cement coating is required to hold the resistance wire, the walls of the heating chamber being provided with spiral grooves in which the wire is wound. They are built in Muffle, Tube and Crucible designs.

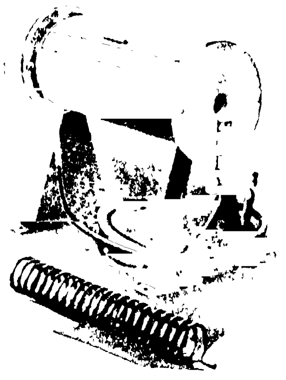
The FD Furnaces are made for 110 or 220 volt circuits, alternating or direct current. All styles require use of rheostat. The maximum safe operating temperature is 1850° F. (1000° C.) Described completely in Hoskins Bulletin No. 13.

Note the ease with which the Type FD Furnace can be taken down. Disconnect the wires under the shelf, take out the four corner screws in the front-head, and all parts are readily accessible.

TYPE FD FURNACE SIZES

Type No. Muffle	Size of Heating Chamber W	D	L
FD 201	3½"	2½"	7"
202	4½"	3"	10"
203	5½"	4½"	12"
204	7½"	5½"	14"
206	12"	8"	19"
207	12"	8"	26"
255 Multiple Combustion Furnace 5 holes			
Tube	Size of Heating Chamber		
FD 302	1¼" dia. x 12" long		
Crucible	Dia.		Depth
FD 101	2"		2½"
103*	4"		4"
104*	5"		5"

* Not regularly carried in stock



TUBE FURNACE TYPE FH-302

Type FB—These furnaces are especially adapted to heavy duty or continuous operation, and are capable of 24-hr per-day service if required. They are made in Muffle, Crucible and Tube designs. In the muffle furnace, the heating units are in the form of hair-pins which entirely surround the heating chamber. In the Crucible and Tube furnaces, the heating unit is in the form of a coil which radiates the heat directly onto the furnace contents. All repairs can be easily made by the operator.

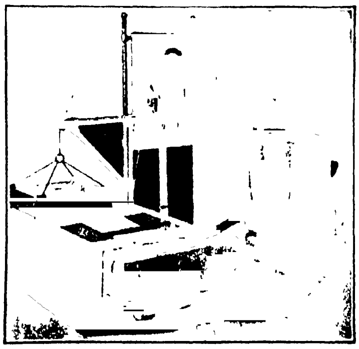
The FB Furnace is best operated on low voltage, alternating current circuits and requires a transformer. Maximum safe temperature is 2000° F. (1100° C.) See Hoskins Bulletin No. 80.

TYPE FB FURNACE SIZES

Type No. Muffle	Size of Heating Chamber † W	D	L
FB 203	4½"	3"	9"
204	7½"	5"	12½"
205*	12"	5"	12½"
206	12"	8"	19"
207	12"	8"	26"
208*	12"	8"	33"
255 Multiple Combustion Furnace 5 holes			
Tube	Size of Heating Chamber		
FH 302	1¼" dia. x 12" long		
Crucible	Dia.		Depth
FB 102	2"		2½"
103*	4"		6"

* Not regularly carried in stock.

† Temperature regulation of Types FB 204 to 208 inclusive is by means of a regulating transformer. All others use a rheostat.



HIGH TEMPERATURE FURNACE TYPE FC-103

Type FC High Temperature—This is a crucible furnace for temperatures up to 1800° C. Operates on A. C. 110, 220 or 440 volts. Made in four sizes, ranging from 3" x 3" x 3½" to 10" x 10" x 11". See Hoskins Bulletin No. 91.

Continued on Next Page

HOHMANN-NELSON COMPANY

Manufacturing Engineers

EAU CLAIRE, WIS., U. S. A.

TRADE **Honeco** MARK

PRODUCTS

Thermometers for Industrial, Engineering, Laboratory and Chemical requirements; Recording Thermometers; Automatic Controllers, Airless and Air-operated types, for Temperature Pressure, Vacuum, Time and Condensate discharge; Thermo Steam Traps.

HONECO INDUSTRIAL THERMOMETERS

The Mercurial Thermometers, so universally employed in all manufacturing and engineering operations, have been identified with the name "Hohmann" ever since their introduction, and the Honeco are the ultimate perfection of over 35 years of Thermometer development and progress, and are still manufactured under the direction of A B Hohmann, the man who originated them

They are made in the various forms and sizes, that are now standard, provided with the fittings, attachments and features, that make them applicable for every possible requirement, and of scale ranges, from minus 40° to plus 1000° F, or equivalent

"HONECO" INDUSTRIAL THERMOMETER

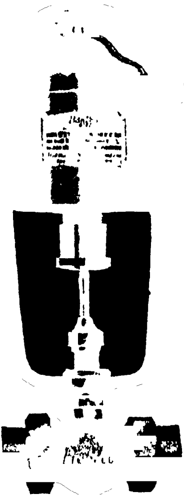
RECORDING THERMOMETERS

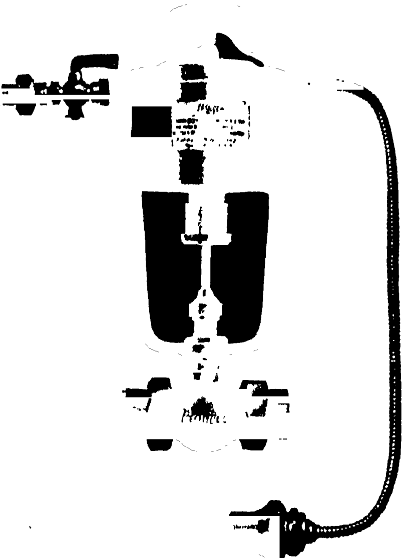
Vapor tension and mercury actuated types, of self-contained and long distance forms, with various ranges, fittings, attachments and features for all requirements

HONECO AIRLESS CONTROLLERS

A Nelson creation, made only for controlling temperature and pressure, requiring no auxiliary motive power for operation, and the only self-contained Controllers that for many applications closely rival the air and water operated types, in ease and accuracy of adjustment, and closeness of control

The operating ranges of the Temperature Controller are from plus 40° to plus 650° F, and the Pressure Controller from 1 to 150 pounds

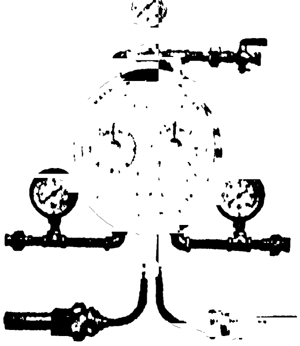

"HONECO" AIRLESS PRESSURE CONTROLLER


"HONECO" AIRLESS TEMPERATURE CONTROLLER

HONECO AIR-OPERATED CONTROLLERS

Another Nelson invention, the distinctive feature of which is the valve in adjusting screw, accessible and removable from the front of the case without disturbing any connections, eliminating air valve and adjustment troubles and insuring operation that surpasses all previous performance of air operated Controllers, for continuous satisfactory service

These Controllers, in conjunction with Diaphragm Motor Valves as shown below, are made for controlling Temperature, Pressure, and Vacuum, the operating ranges of which are respectively Minus 40 to plus 750° F - the fraction of a pound to 400 pounds per square inch ¼ to 30 inches of mercury


"HONECO" TWIN TYPE AIR OPERATED TEMPERATURE CONTROLLER

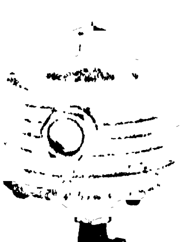
Also made for Time and Condensate Control, the former for automatically shutting off the heating or cooling medium, blowing off steam, admitting cooling water, ringing or lighting a signal, at the expiration of any time period for which the Controller is set, and the latter for discharging condensate, wet steam, and air, from steam apparatus, at any temperature or pressure, performing this service far more effectively than any steam trap.

HONECO THERMO STEAM TRAP

Simple and compact and performs a service not possible with float and bucket type traps

Has only one moving part, which is the powerful, indestructible and unchangeable motor, which operates without stress, strain or wear, on the unfailing thermal principle of expansion and contraction, effectively draining apparatus, coils, etc., of all condensation, wet steam and air, thereby insuring highest heating efficiency and also uniformity of temperature in steam heated spaces

Suitable for pressures to 100 pounds, adjustable for any temperature to 350° F. and provided with valve opening of the same capacity as inlet and outlet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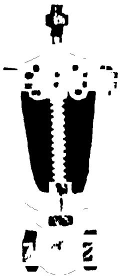

DIAPHRAGM MOTOR VALVE

THE HOTTMANN MACHINE CO.

Cutting and Mixing Machinery

810 NOBLE ST., PHILADELPHIA, PA.

PRODUCTS

Mixing Machinery for liquids, semi-liquids, pastes, powders and all materials requiring thorough mixing.

The Hottmann Twin Screw Super Mixer.

Cutting and Mixing Machinery for the packing industry.

Machines for cutting, mixing and filling.

USES

Our mixers are adapted to use in the following industries, as well as many others.

Asbestos
Asphalt Compositions
Candy, Chocolate, Chewing Gum
Carborundum Mixtures
Cement Mixtures
Cork and Celluloid Compositions
Color Mixers
Crucible Mixtures, Duplicator Masses
Enamels

HOTTMANN CUTTER AND MIXER
Showing Front Door and Side Outlet Open

Capacities 300 to 600 lbs each charge For cutting and mixing meat for sausage or for canning purposes This machine does work which usually requires two machines

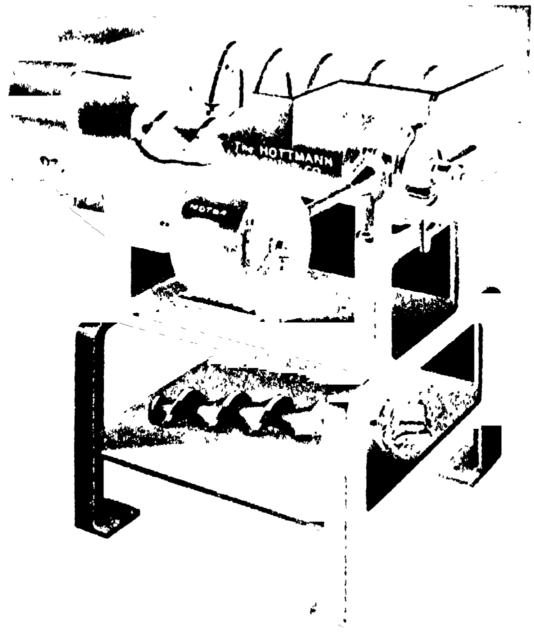
Graphite Compounds
Inks, Printing and Lithograph
Margarines
Meat Mixtures
Oils, Greases, Emulsions
Paints, Varnishes, Putties
Pastes, Powders, Polishes
Pulps
Photographic Film Mixtures
Viscose

TWIN SCREW SUPER MIXER

The principle of this machine is new, and its performance such as to insure the most intimate mixing of ingredients.

A pair of slow-moving mixing and kneading arms convey the product to a high-speed mixer and beater. The mixer and beater returns the material to the mixing and kneading arms, thus developing a complete cycle of performance heretofore unknown to the industries.

This action keeps every particle of the mass in constant, violent and irregular agitation, and allows no opportunity for dead spots in the mass, thus insuring mixtures which are complete and uniform.



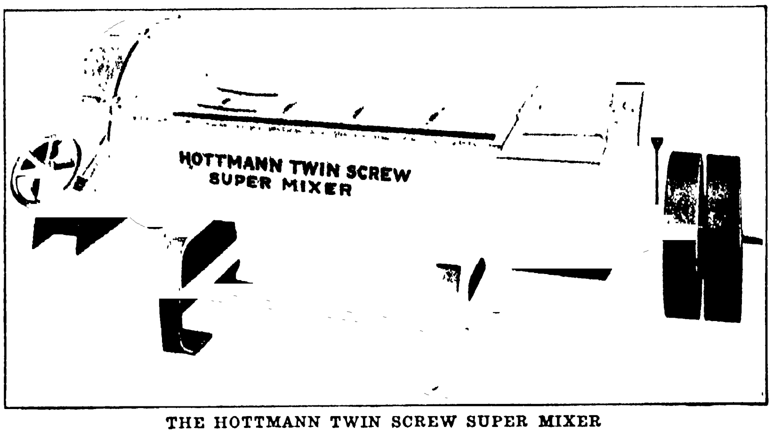
THE LATEST DEVELOPMENT COMBINING A NOVEL CUTTING, GRINDING, MIXING AND FILLING MACHINE

This cuts, mixes, and automatically fills containers By changing cutting blades to grinding blades it will pulverize and mix nearly all products Invaluable for experimental work for laboratory work for handling small quantities, and to supplement the work of larger machines Built in small sizes but designed for use in large sizes for quantity production Simply turn a handle and this machine automatically discharges the finished product into containers

By the addition of a steam jacket this mixer is adapted to the mixing of substances at elevated temperatures. It is built with or without this steam jacket.

This machine empties itself automatically, and is very easily cleaned. It is designed to give the most economical and satisfactory results.

Made in large and small sizes. Motor-driven, chain-driven, or belt-driven.



THE HOTTMANN TWIN SCREW SUPER MIXER

This machine combines two distinct mixing motions A Slow speed Mixing and Kneading Movement and a High speed Mixing and Beating Operation, resulting in maximum production and efficiency This new system always saves time and labor and in many cases improves the products

HOHMANN-NELSON COMPANY

Manufacturing Engineers

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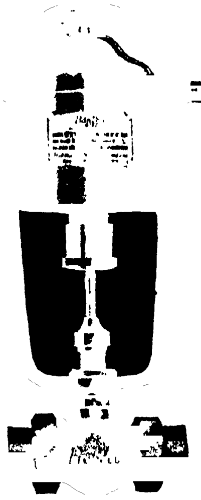
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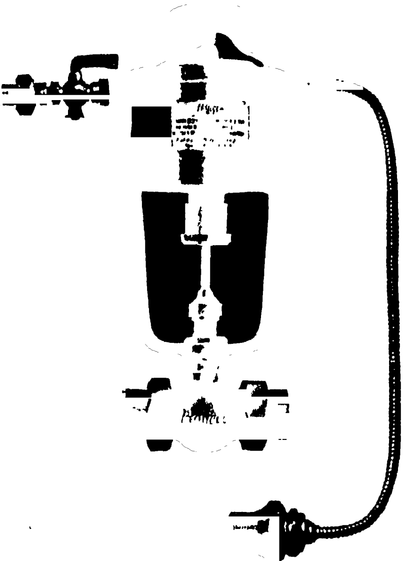
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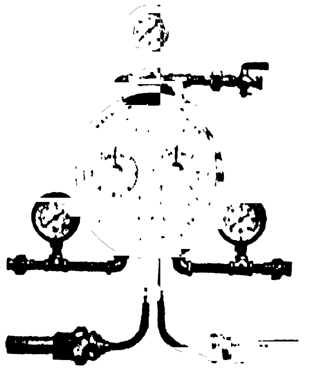
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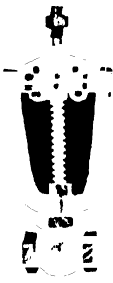

DIAPHRAGM MOTOR VALVE

HOUCHIN-AIKEN COMPANY, INC.

Engineers and Machinists

Soap, Candle, Glycerine, and Chemical Machinery

113-123 FIFTY-THIRD STREET, BROOKLYN, N. Y.

Works Hawthorne N. J. — Shipping Point North Paterson, N. J.

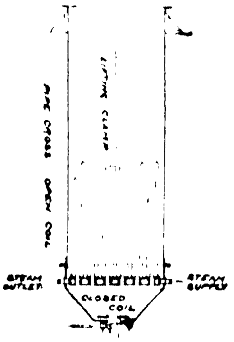
PRODUCTS

Crutchers, Mixers, Remelters, Amalgamators, Plodders, Frames, Mills, Kettles, Cutters, Slabbers, Chippers, Soap Presses, Dies, Chemical and Special Equipment.

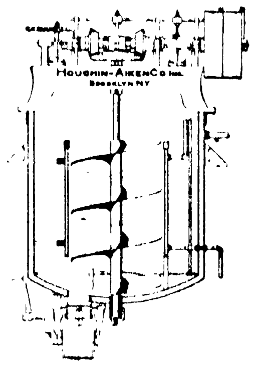
Plans, Specifications and Equipment for Complete Plants Furnished

SOAP REMELTER

Coil consists of series of vertical pipes screwed in cast iron header, closed steam coil at outlet to keep soap from cooling.



SOAP REMELTER



PERFECTION JACKETED CRUTCHER

PERFECTION JACKETED CRUTCHER

Adapted to all kinds of soap, jacket tested to 100 lbs steam pressure, reversible clutch, 5 x 7 gate, enclosed gearing. 1500-6000 lb. capacity

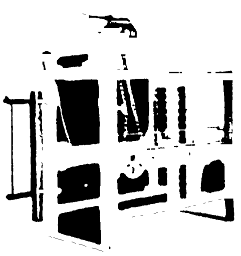
STANDARD SOAP FRAME

Skeleton ends, steel lined, sides No 12 gauge steel, 1200 and 600 lb sizes, with patent pivot plates for easy handling.

STANDARD SOAP FRAME

AIKEN POWER SLABBER

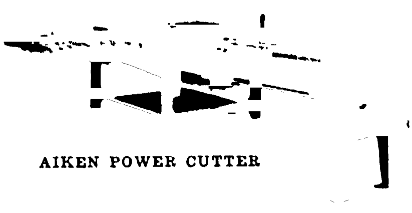
Worm drive, removable cutting heads, with motor or belt drive



AIKEN POWER SLABBER

AIKEN POWER CUTTER

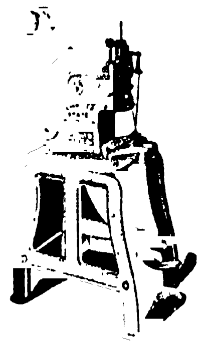
Of iron and steel, cutting heads removable, can be made to cut and stamp soap at same time.



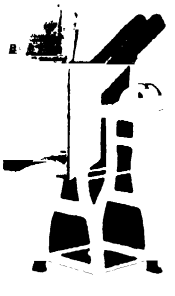
AIKEN POWER CUTTER

EMPIRE STATE PRESS

Foot power, capacity 20,000 cakes per day, floor space 2' x 3'



EMPIRE STATE PRESS



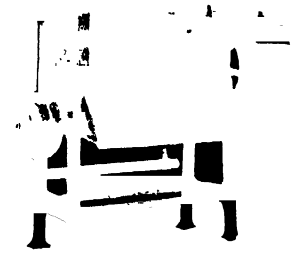
SOAP CHIPPER

SOAP CHIPPERS

Capacity 2000 to 8000 lbs. per hour

IDEAL AMALGAMATOR

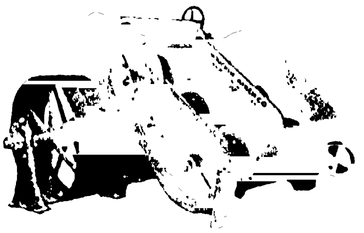
This machine saves one milling and color and perfume are uniformly mixed with the soap, 250 lbs per charge.



IDEAL AMALGAMATOR

2, 3, AND 4 ROLL SOAP MILLS

Granite rolls, bronze bearings, rolls ground on bearings and run true



2-3-4-ROLL SOAP MILL

SCREW PLODDERS

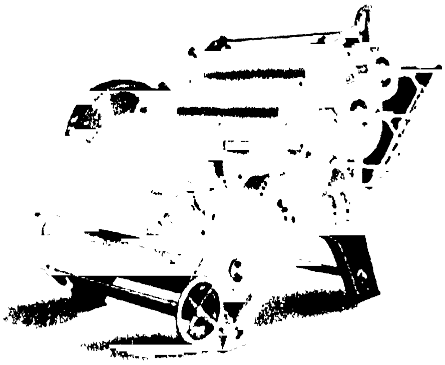
4, 6, 8, 10, 12 inch screw, encased worm drive, runs in oil, capacities 500 - 18,000 lbs. per day.

SCREW PLODDER

Continued on Next Page

FIVE-ROLL FLAKE MILLS

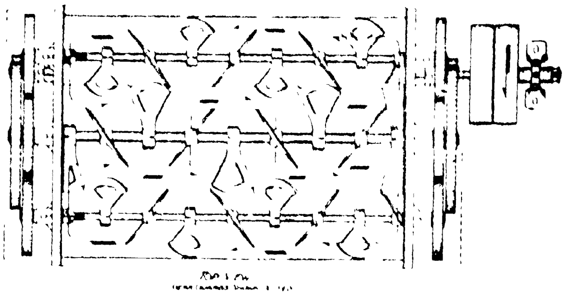
With chilled rolls, ground on bearings, to insure running, cut gears, can be fitted with a silent drive, used with a four-roll stone mill in tandem produce thin and transparent soap flakes

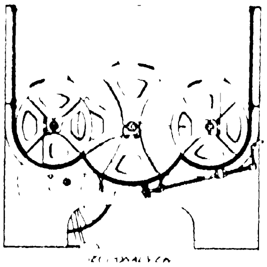


5 ROLL FLAKE MILL

H-A CONTINUOUS SOAP DRYER

Unique patented design, uses both sides of aprons, 80% increased capacity, aprons of steel, will wear indefinitely, can be built in any size, cooling device if desired





SIZE 12, CLASS II, 750 GALLON CAPACITY

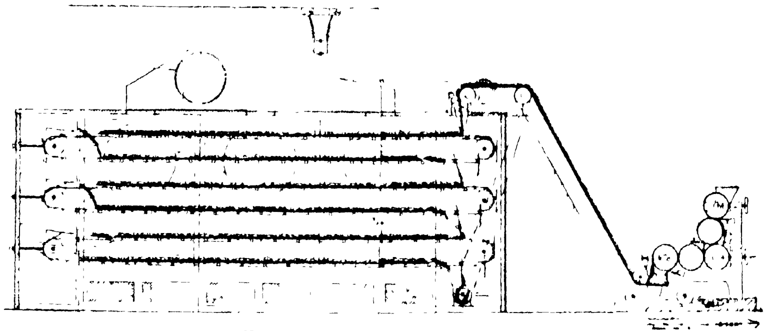
B AND B PATENTED ULTRA-MIXER

A machine possessing new and effective mixing principles, assuring a positive and uniform mixing of materials regardless of differences in specific gravity, viscosity, etc

Due to the positive circulation, splitting up, slicing and cutting action of the unique shaped blades, during its course through the machine, as shown by the arrows in illustration, the material under treatment does not bunch, carry around with the shaft or possess any "dead spots."

It is equally effective on liquids, powders and pastes, making it a truly universal machine

Sizes 2½ to 2000 gallons, plain or jacketed.



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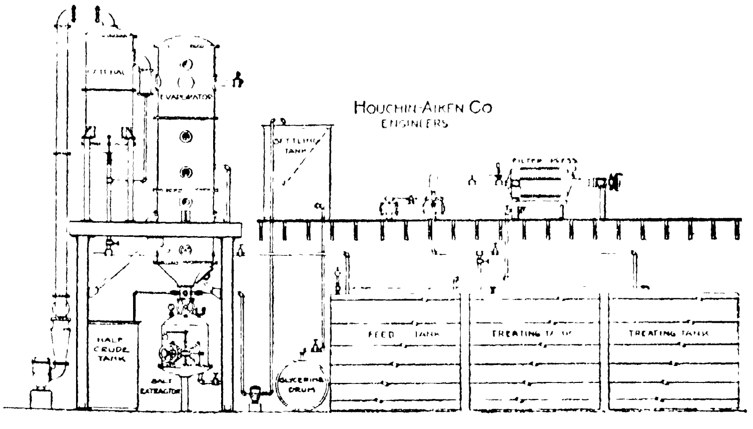
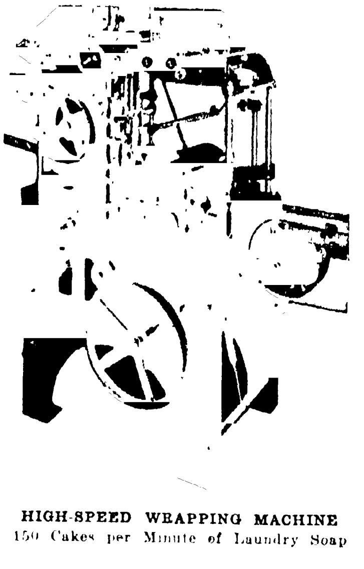


CRUDE GLYCERINE RECOVERY PLANT



HIGH-SPEED WRAPPING MACHINE
150 Cakes per Minute of Laundry Soap

NORMAN HUBBARD'S SONS

Vacuum Pumps

265-7 Water Street
BROOKLYN, N. Y.

PRODUCTS

Improved "Packard" Vacuum Pumps.
"Hubbard" Rotary Vacuum Pumps.

"PACKARD" VACUUM PUMPS

This pump is suitable for any operation where a high degree of vacuum is required. It has been designed to give the highest vacuum attainable without the use of water in the cylinders. Constructed for heavy continuous work when operating at the greatest possible speed.

Recent improvements have made the pump more suitable for quick exhaustion of vacuum closets or retorts than the old style of pump formerly used for this purpose. The "Packard" Vacuum Pump is meeting with pronounced success in the chemical industries when used in connection with vacuum pans.

The cylinders are placed vertically in a cast iron box which serves as a bed plate and water jacket, and on which the frame and working parts are mounted. The frame is exceedingly rigid, insuring smooth and easy running, all the parts are accessible, the bearing surfaces being of ample size and adjusted easily in case of wear. Each cylinder is entirely independent of the others and can be used separately or connected up, as required. The suction pipes are connected at the bottom of the jacket by means of valves which are provided with traps to arrest any dirt, and the exhausts are piped to a pot which acts as a trap to catch the oil used in lubricating the cylinders, this oil is thereby saved and may be used over again.

All the valves are opened and closed at the proper instant, automatically, not requiring an air pressure below them to do this work. The main valve stem does not pass through the piston head, as is usual with valves of this type. The piston packing is formed of hemp, which has been found, after numerous experiments, to give the best results, it is tight, wears well, and is easily and cheaply renewed when this becomes necessary.

NO. 2—IMPROVED "PACKARD" VACUUM PUMP

Two 5¼-in cylinders, 8-in stroke. Can be fitted for any drive desired

The clearance in the cylinders is reduced to a minimum, being generally less than 1/16 of an inch, and no liquid is used other than sufficient oil to insure proper lubrication.

The valves in the piston head have their seats close to the bottom and are entirely included in the body of the piston. This construction makes it an impossibility for the valve to break or fail. The exhaust valves are contained in a separate bonnet bolted to the cylinder head.

"Packard" Vacuum Pumps are constructed of the best material obtainable and the workmanship is first class in every respect. All parts are made to gauge and are interchangeable. The cylinders and valves are regularly furnished of iron but can be furnished of brass or composition to suit requirements.

Before shipment each pump undergoes a thorough test in actual operation. A mercury column is used to indicate the vacuum obtained, due notice being taken of the barometric pressure at the time of the test. We guarantee a vacuum of 29½ inches (the barometer being at 30 inches), although a better result is generally obtained.

PRINCIPAL DIMENSIONS

All sizes are either in stock or in progress, and can be supplied promptly.

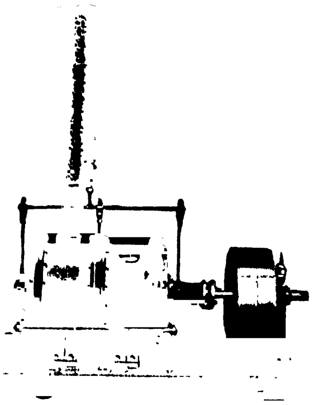
No.	Cyl.	Size inches	Floor space inches	Speed revolutions per minute	Pulley inches	Horse power	Free air per minute cubic feet
Lab.	1	3 × 6	10 × 12	85	18 × 3	¼	2
0	1	4¼ × 6	12 × 12	120	20 × 4	½	6
1	2	4¼ × 6	18 × 18	115	24 × 4	1	11
2	2	5¼ × 8	20 × 24	110	28 × 4	1	22
2 A	3	5¼ × 8	32 × 24	109	28 × 4	1½	30
3	3	4¼ × 6	18 × 22	110	24 × 4	1	16
4	2	7½ × 9	26 × 36	75	36 × 6	3	35
4 A	3	7½ × 9	26 × 51	70	36 × 6	4	50
6	2	12 × 12	48 × 60	60	26 × 9	6	94

"HUBBARD" ROTARY VACUUM PUMP

This pump is manufactured in single and double stage and can be arranged for any type of drive desired.

Designed for ordinary work not requiring vacuum over 28 to 29 inches. The double stage, or two cylinders connected in series, is used for work requiring very high vacuum and will show on mercury gauge, vacuum one-tenth of an inch (1/10") of the barometer reading.

One of these pumps (a small laboratory pump running in oil) in a test by the United States Department of Commerce produced a vacuum of 0.9 mm. or 0.035 (1/28) inch.



"HUBBARD" TYPE "A" TWO STAGE ROTARY VACUUM PUMP

F. C. HUYCK & SONS

Kenwood Mills

ALBANY, N. Y.

PRODUCTS

- Woolen Filter Cloths.
- Paper Makers' Felts, Seamless Felts, and Kenwood Tan Jackets.
- Leather Press Tan Jackets or Wringer Felts.
- Leather Board Felts.
- Cushions or Bolsters for Setting Out Machines.
- Felt Pads for Embossing Machines.
- Sieve Cloths.
- Bag-house Cloths.

EXPERIENCE

The half century during which we have made woolen products for the American manufacturer has taught us the important requirements of these industries. It has enabled us to perfect and standardize our products for efficiency and for economy

SPECIAL CLOTHS

Where special requirements or problems arise, special cloths will be developed to meet the need. A competent research laboratory is maintained in the interests of the trade.

KENWOOD WOOLEN FILTER CLOTHS

These cloths are adapted to all types of filtering apparatus. They are standardized for strength and long wear and do not stretch or shrink.

APPLICATIONS

Kenwood cloths are used in the refining of metals; manufacture of acids, explosives, salts of antimony, zinc, nickel, radium, vanadium and other inorganic salts, in the preparation of intermediates, acid dyes, medicines, and chemical products generally. Especially applicable to operations requiring very fine filtering media

SIZES

Kenwood Woolen Filter Cloths are furnished in any widths—preferably in rolls of 50-yard lengths.

CORRESPONDENCE AND TRIAL ORDERS

Correspondence and trial orders are invited.

PRICES

Will be quoted promptly on standard or special cloths.

DELIVERIES

Prompt and uniform deliveries are guaranteed by large manufacturing facilities.

C. W. HUNT COMPANY, INC.

Manufacturers of Industrial Railways and Coal Handling Machinery

GENERAL OFFICE AND WORKS
WEST NEW BRIGHTON, N. Y.

REPRESENTATIVES

New York, N. Y. C. W. Hunt Engineering Corp.,
143 Liberty Street

Boston, Mass. Ernest F. Learned,
141 Milk Street

Chicago, Ill., Phillips, Lang & Company, Inc.
538 South Dearborn Street

Washington, D. C. James P. Mewshaw
710 Fourteenth Street N. W.

PRODUCTS

Industrial Railway Tracks; Switches; Motor Operated and Push Cars; Scales; Electric Mine and Industrial Locomotives; Cable Railways; Automatic Railways; Conveyors; Coal Crackers; Skip Hoists; Bin and Hopper Gates; Weighing Larries; Coal Tubs; "Stevedore" Manila Transmission and Hoisting Rope; Drilling Cable; Transmission Rope Couplings.

INDUSTRIAL RAILWAY AND EQUIPMENT

Tracks—Made Up—Made in sections, 20 ft. long of standard light rails riveted to cupped or flat steel ties. Ties spaced 21½ in. centers and 7½ in. from ends. Special lengths to order.

FIG. 1—CAST PLATE STRAIGHT TRACK
Sectional view

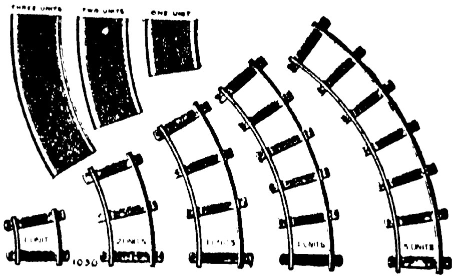


FIG. 2—ROLLED STEEL AND CAST PLATE CURVES

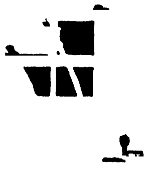


FIG. 3—LEFT-HAND SWITCH, WITH STAND

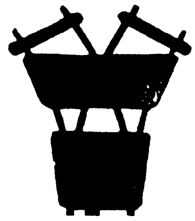


FIG. 4—TWO-WAY SWITCH

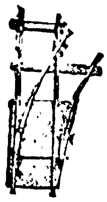


FIG. 5—RIGHT-HAND SWITCH

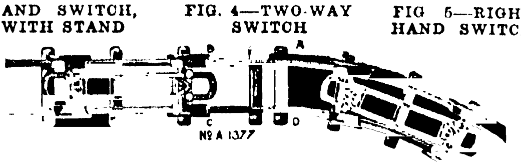


FIG. 6—POSITION OF TRUCK AXLES WHEN ROUNDING A CURVE

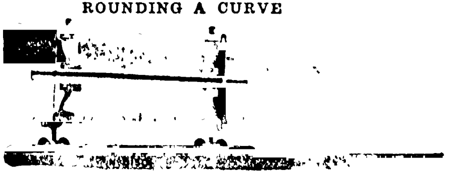


FIG. 7—THEORETICAL CONE AND CIRCULAR PATH BY AXLE AND WHEELS IN ROUNDING A CURVE

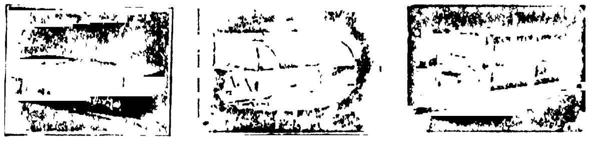
Knocked Down—Made in sections 15 ft. long of standard light rails, bolted up in field to special cross ties with clips and bolts. Special lengths to order.

Cast Plate—Track cast integral with plates and made in standard lengths up to 5 ft. (Fig. 1).

Curves—Hunt short radius curves are made with a special guard rail which in conjunction with Hunt special running gears eliminate friction when cars are rounding sharp curves (Figs. 2, 6 and 7).

Switches—Left-hand, right-hand, 2-way or 3-way, with or without stands. Also can be furnished in cast plate (Figs. 3, 4 and 5). Frogs, crossovers and turntables are also manufactured. Any workman of ordinary intelligence can put together a whole system ready for use.

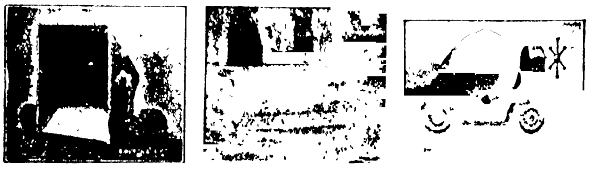
Cars—Bodies of various designs to meet a wide range of use, but all have essentially same truck construction. Axle bearings are either plain or roller bearing. Arrangement of running gear (Fig. 6) facilitates propulsion on short curves. Standard width for clearance of cars is 4 ft. Curve radius, 12 ft.



No. 011
Standard Eight-wheel Shop Car

No. 6355
Standard Charging Car

No. 07129
Standard Four-wheel Self-dumping Push Car



No. 014
Standard Tip Car

No. 0594
Standard Shop Car

No. 0191
Standard Foundry Car

FIG. 8—INDUSTRIAL RAILWAY CARS

Track Scales—Made in both iron and wooden frames, especially designed for use with industrial railway, track ends connecting directly with either cast plate track or made-up steel track of railway system.

Electric Locomotives for Industrial and Mine Service—Narrow gage electric locomotives in connection with industrial railways further reduce cost of handling material. Designed to take full load around 12-ft. radius curves as easily as on straight track.

Various types of locomotives are made to pull loads up to 50 tons.

Standard machine as shown (Fig. 9) is built for any track gage from 18 to 36 in. Minimum curve radius 10 ft. Rated draw bar pull, 800 lbs., at 4 miles per hour; steel wheels slip at 1600 lbs. starting pull.

FIG. 9—STANDARD ELECTRIC LOCOMOTIVE

Locomotives can be equipped with storage battery for motive power, or current can be taken from over-

Continued on Next Page

ead trolley or from third rail. Motors and gears are enclosed to protect them from injury and dust. Speed, variable, from 1 to 10 miles.

Also load carrying motor cars (Fig. 10), 1-ton to 10-ton capacities.

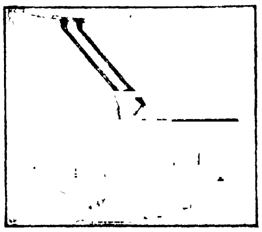


FIG 10—MOTOR DRIVEN SELF-DUMPING CAR

HUNT'S AUTOMATIC RAILWAY

Designed primarily for transporting coal, sand, rock, cement and similar bulk materials from railway cars or vessels to storage bins where run does not exceed 600 ft. Operation is entirely automatic. Time consumed for round trip of 300 ft., dumping its load and returning, is about 50 seconds. Requires services of only one man—the craneman.

In operation, loaded car is started down an inclined track, and a few feet ahead of discharging point picks up a cross bar which is attached to a cable leading to a weight box. This raises weight box, and when load is discharged from car the reaction due to falling weight returns empty car to loading point.

Two sizes of cars are manufactured 1-ton and 2-ton capacity. Made of wood, lined with sheet steel.

CABLE RAILWAYS

Adapted for handling coal and for carrying heavy material from point to point. Used extensively in conveying coal from barge to storage bins. Standard gage, 21½ in.; curve radius, 12 ft.

SKIP HOISTS

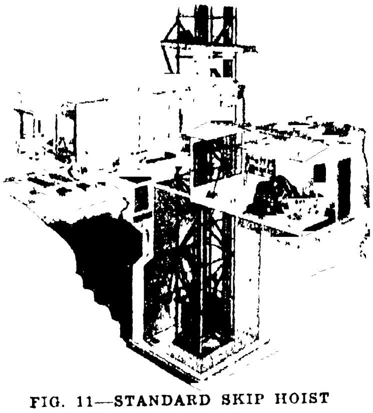


FIG. 11—STANDARD SKIP HOIST

Consists of load-carrying bucket, wire hoisting rope, head and leading sheaves, electric single drum hoisting engine with motor, traveling cam control and electrically operated brake, bucket guides, loading pit valve or loading chute, control panel and push button station for operating machine.

Single bucket skip is counterweighted and guides constructed for properly guiding counterweight and bucket. Electric skips with drum type controller and steam hoist friction operated skips of high speed can be furnished if desired. Skip hoist can be operated equally well whether vertical or inclined. Capacities from 25 to 300 tons per hour.

OVERHEAD WEIGHING LARRIES

Built to meet existing conditions with one way or bifurcated chutes to serve a single or double line of stoker hoppers. Accurate records of coal consumption registered on cards. Manually or electrically operated either from boiler room floor or cab. Capacities ½ ton and up.

FIG. 12—OVERHEAD WEIGHING LARRY

CONVEYORS

FIG 13—SECTION THROUGH A POWER PLANT EQUIPPED WITH HUNT CONVEYOR

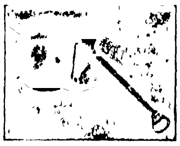
The Hunt pivoted bucket conveyor carries bulk material, dry or liquid, noiselessly in any direction without shock, breakage or violence. Three types of conveyors are manufactured: "Standard," with independent buckets, being separately filled, "Continuous," with edges of buckets in contact; "Lip Type," with edges of buckets overlapping — material being spouted into conveyor in constant stream without spill or scatter.

Buckets are suspended on pivots so that gravity keeps them upright whether track be horizontal, vertical or inclined. Conveyor driven by pawls which run smoothly on driving pins on chains. Whole conveyor designed for thorough lubrication of all bearings.

All parts interchangeable. Conveyor will operate on 5 to 10 h. p.

Special automatic machinery is designed for filling each "Standard" type bucket with definite quantity of material. Several fillers can be arranged for measuring and mixing different materials.

CUT-OFF VALVES OR GATES



For controlling flow of coal, broken stone, sand, etc., from storage bins to mechanical stokers, mixers or cars. Installed at side or bottom of bins, or at end of spout. Hand operated by single lever, but power can be applied to larger sizes. Have no sliding parts, but jaws rotate on centers, cutting through material without jamming. Normal tendency of valve is to close automatically by gravity. Almost every requirement may be met with standard types or modifications.

FIG 14 CUT-OFF VALVES

Fig. 16 shows a low body duplex valve with outside flanges particularly suitable for ash hoppers. If the conditions are unfavorable for the operation of any other type of cut-off valve, these duplex valves will be successful. They are heavily built and are not quickly burned out.

FIG 15—VALVES AND CHUTES

FIG 16—LOW BODY DUPLEX VALVE

HYATT ROLLER BEARING COMPANY

NEW YORK, N. Y.

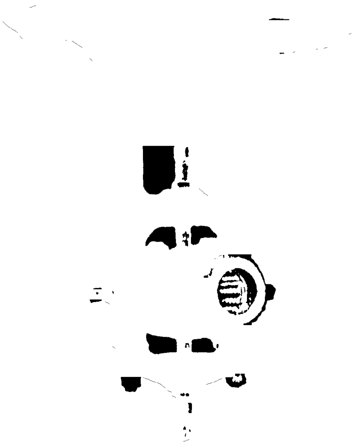
PRODUCTS

Roller bearings for mine cars, countershafts, service cars, trucks of all kinds, cranes, trolleys and hoists, steel mill equipment, concrete mixers, textile machinery, conveyors, etc.

HYATT LINE SHAFT ROLLER BEARINGS

The widespread need for increased efficiency in production has caused more attention to be paid to the power savings made possible by reducing the friction of moving parts of machinery. The perfection of anti-friction bearings has eliminated a large percentage of the power waste caused by ordinary friction bearings.

The true rolling motion of the Hyatt Line Shaft Roller Bearing eliminates at least 50% of the friction that exists in plain babbitted bearings, making possible a reduction of 15% of the total power. By the use of Hyatt Line Shaft Roller Bearings; therefore, you can either increase your present equipment without enlarging your power plant or you can effect a 15% reduction in your power bill—a saving of special importance at this time.



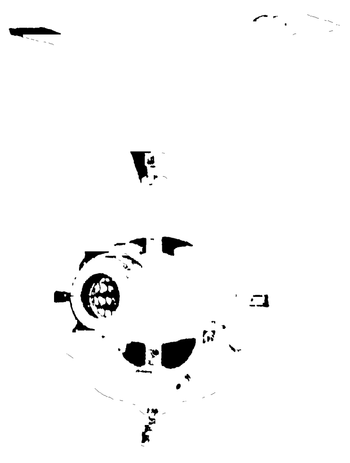
HYATT LINE SHAFT BEARING
Mounted in a Standard 4 Point Set Screw Hanger

Hyatt Line Shaft Roller Bearings are made for all standard sizes of shafting and being split can be slipped into position without removing pulleys, couplings or hangers. The boxes are filled with oil, after which they need not be lubricated for another four months.

The bearing itself consists of a series of flexible rollers of chrome-vanadium steel, retained in position by a substantial steel cage. Being hollow and having helical openings throughout their length, the rollers continually cover all bearing surfaces with oil.

Hyatt Line Shaft Roller Bearings are sturdily and accurately constructed and give satisfactory service year in and year out. There are many of them still in operation after 25 to 30 years of practical service—earning dividends through savings in power, oil and labor.

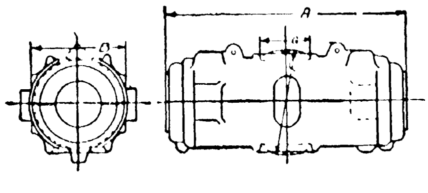
Install Hyatt Line Shaft Roller Bearings in your present hangers and on all new equipment. Save power, oil and attention. Our Line Shaft Bulletin containing prices and sizes of boxes and hangers and engineering data will be of real value to you.

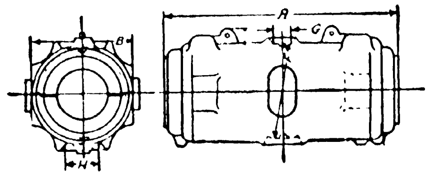


HYATT LINE SHAFT BEARING
Mounted in a Pioneer Steel Hanger

DIMENSIONS OF HYATT STANDARD BEARINGS

Either U-G or B. & S. bearings may be used in Hyatt 4-point set screw hangers and others with sufficient frame openings





Diam of Shaft, In	Approx Weight, Lbs	A		B		F		G		H
		BS	UG	BS	UG	BS	UG	BS	UG	UG
1 7/16	11	8 1/4	8 1/4	3 5/8	3 5/8	3 3/4	3 7/8	1 13/16	1 1/4	1 13/16
1 11/16	14	9 1/4	9 1/4	3 5/8	3 5/8	3 7/8	4	1 13/16	1 1/4	1 13/16
1 15/16	22	10 1/2	10 1/2	4	4	4 1/2	4 7/8	2 1/2	1 3/4	2 3/16
2 3/16	27	11 1/2	11 1/2	4 1/4	4 1/4	4 7/8	5	2 1/2	1 3/4	2 3/16
2 7/16	38	13	13	5	5	5 5/8	5 3/4	3	1 3/4	2 3/16
2 11/16	46	14	14	5 3/8	5 3/8	5 7/8	6	3	1 3/4	2 3/16
2 15/16	60	15 1/4	15 1/4	5 7/8	5 7/8	6 1/2	6 1/2	3 1/2	2 1/4	2 13/16
3 3/16	67	16 1/2	16 1/2	6 1/2	6 3/8	6 1/2	6 3/4	3 1/2	2 1/4	2 13/16
3 7/16	110	17 1/4	17 1/4	7 1/4	7 1/4	7 1/4	7 3/4	3 3/4	2 1/4	2 13/16
3 11/16	182	19 1/2		8 1/4	.	10 1/2	....	4 5/8		...
3 15/16	230	20	20	8 3/4	8 1/2	10 1/2	9 5/8	4 5/8	2 7/8	3 3/16
4 7/16	280	22 1/4	22 1/4	9 1/2	8 5/8	10 1/2	10	5 1/2	2 3/4	3
4 15/16	330	21 1/2	...	10	.	10 1/2	..	6 3/8	...	...
5 7/16	380	21 3/4	...	10 3/4	....	12	...	6 7/8	...	...
5 15/16	500	30	....	12	....	12 5/8	....	6 7/8	...	...

INDEPENDENT FILTER PRESS CO., INC.

Manufacturers of
Filter Presses for the Chemical Industries
GENERAL OFFICES AND WORKS
118 THIRD AVENUE, BROOKLYN, N. Y.

PRODUCTS

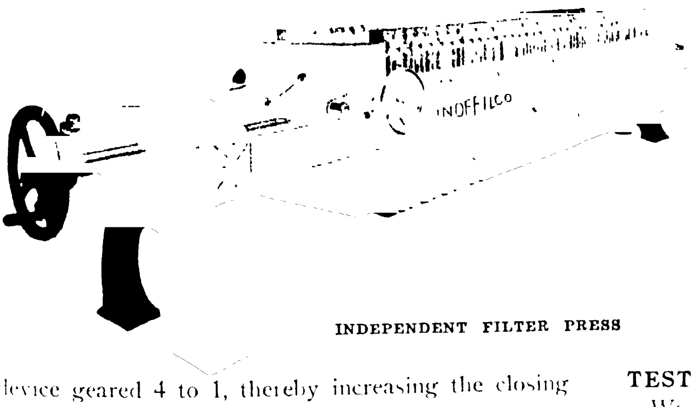
Filter presses, of Wood and Iron, for all Chemical and Allied Industries.

INDEPENDENT FILTER PRESS

This press has been on the market for a number of years and is being used by an increasing number of chemical manufacturers who demand a "long life" press and at the same time one that is low in first cost. First-class workmanship in the construction of the entire press makes its claim to long life, efficient manufacturing methods make it a low first cost apparatus.

The Independent Filter Press is successfully employed for the filtration of liquors of varying physical and chemical characteristics, including alkaline, acid and neutral solutions. It is built to stand up under hard usage. The press frame proper is constructed of the finest grade cast iron and steel.

Each press is provided with an improved ratchet and thrust block for quick and economical operation. It is only necessary to draw the pressure screw back 1 or 2 inches when the thrust block can be pushed aside and the follower then drawn back. Our larger presses are equipped with a gear and pinion closing device geared 4 to 1, thereby increasing the closing power in that proportion.



INDEPENDENT FILTER PRESS

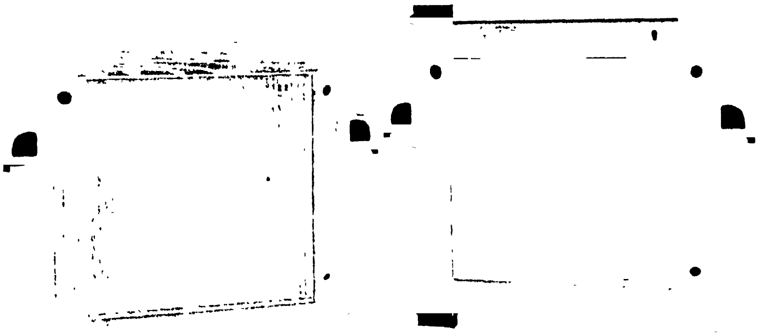
Plates and frames are constructed of the best lumber obtainable in Yellow Pine, Maple or Cypress. Liner pipes through the heads of the presses are of lead, iron or bronze to suit the conditions.

TYPES OF PRESSES

Type A—Square corner feed, Plate and Frame Type for forming cakes up to 3″ thick. Constructed either for the washing or non-washing of the solid matter with open or closed delivery.

Type B—Square center feed, Recessed Type for forming cakes up to 1½″ thick. Constructed either for washing or non-washing of the solid matter with open or closed delivery.

Closed delivery presses are used for volatile liquids



"INDEFILCO" PATENTED IMPROVED MOVABLE FIELD PLATE
Patent No. 1,282,111

IMPROVED TYPE FILTER PLATE

The features of this type of plate are entirely new and were developed by us to meet certain filtering conditions caused by warping and swelling of the ordinary type of plate. Our improved and patented plate is made with a movable field set in a rigid frame. This type of construction prevents warping and swelling. It eliminates leakage and assures proper alignment of feed and wash channels.

LABORATORY FILTER PRESSES

We build special laboratory types in wood or iron for industrial research laboratories. Many of these types are carried in stock.

FILTER CLOTH

Our filter cloth department will gladly recommend the kind of cloth adapted for your purpose. Prices for filter cloth sent on application.

TEST DEPARTMENT

We have a department devoted to the running of tests of any fluid. Our engineering department will at all times be pleased to cooperate with prospective clients in solving their filtration problems.

CATALOGS

Catalogs and table of capacities sent upon application.

INDUSTRIAL FILTRATION CORPORATION

Manufacturers of Filters for all Chemical-Industrial Uses

GENERAL OFFICES
115 Broadway, NEW YORK, N. Y.

LABORATORIES
22 E. 16th St., NEW YORK, N. Y.

PRODUCTS

- **Zenith Open Tank Filters,**
  - **Standard, acid resistant and alkali resistant**
- **Zenith Continuous Rotary Filters,**
  - **Single and multiple compartment, alkali resistant and acid resistant, high and low containers**
- **Zenith Continuous Rotary Hopper Dewaterers,**
  - **Standard, alkali resistant and acid resistant**
- **Special Filtering Apparatus,**
  - **Special materials and special construction.**

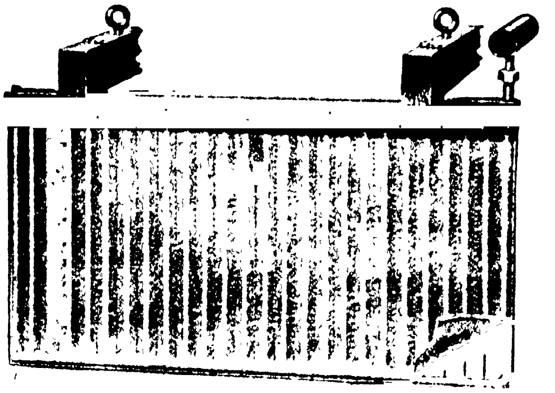
OPEN TANK FILTERS

These filters consist of two or more filtering leaves or cells connected together in the form of a basket, attached to a common header, in conjunction with a movable hoisting device, and one or more open tanks (depending upon the washing requirements)

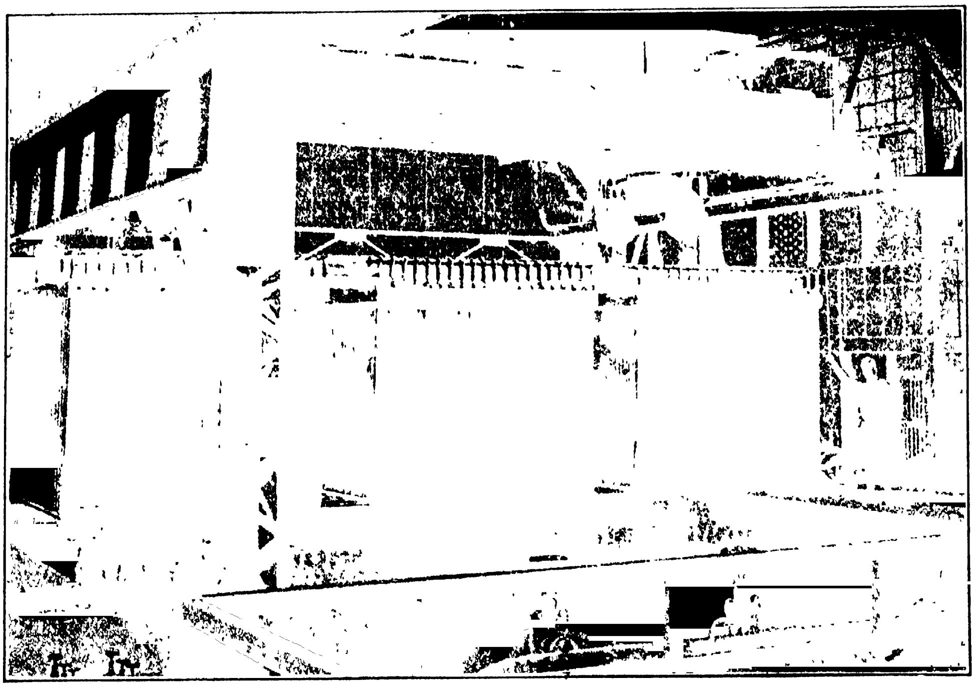
The simple design of this type of filter, well known for its labor saving and positive washing features, makes it possible to construct it with the minimum metallic contact The tanks may be made of wood or may be lead lined and the filter leaves may be made of wood strips, cocoa matting, etc , drainage members, with outlet pipes, of lead, hard rubber, etc

When metallic filter cloth is used as the filtering medium, the immense filter area obtainable per unit floor space commends this filter as a clarifier for caustic alkali liquors

Operation Suction is applied to the interior of the basket of leaves submerged in a loading tank The clear filtrate is drawn through the filtering medium, pipe and header, from whence it collects in a vacuum receiving tank and is discharged continuously either through a barometric leg or by a rotary pump located below the receiving tank The solids collect in the form of a cake on the outside of the filtering medium, the surface of which is uniformly resistant Therefore, when the leaves are removed from the loading tank and submerged in a tank of wash water, they are impoverished of the entrained soluble matter with marked efficiency To discharge the solids the leaves are removed from the washing tank and suspended over the mud collecting hopper The suction is then turned off and compressed air or steam is applied to the interior of the leaves causing the solids to fall by gravity



(Patented)
SINGLE LEAF



LEAF TYPE (Patented)
Large Installation, 11,000 Sq. Ft. Active Filtering Surface

Adaptations—Aluminum Hydrate, Barium Sulphate, Calcium Phosphate, Calcium Silicate, Calcium Sulphate, Dye Intermediates, Epsom Salts, Feldspar, Frying Oils, Insecticides, Iron Hydrates, Manganese Dioxide, Syrups, Uric Acid, Slimes, Cobalt Oxide, etc.

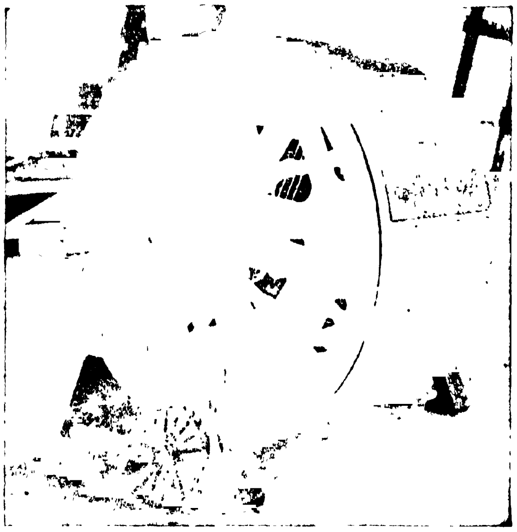
Features—

1. Inspection and control of solution at all times
2. Flexible and elastic design of apparatus.
3. Large expanse of filtering area at small initial cost.
4. Increased capacity of filter at low additional expense.
5. The most thorough and economical method of washing known.
6 Very low operative costs.
7. Immediate and automatic discharge; no scraping of cake.
8. May be constructed in any size desired.

Continued on Next Page

ZENITH CONTINUOUS ROTARY FILTERS

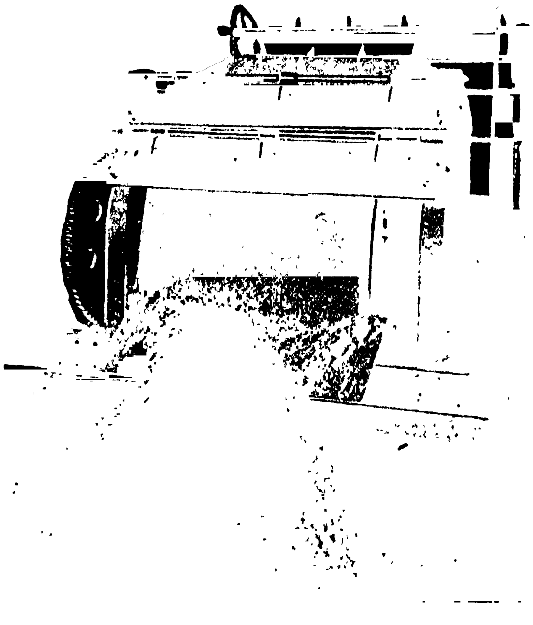
This machine consists of a drum revolving in a container filled with the slurry to be filtered. The periphery of the drum is divided into separate compartments, each covered with a filtering medium. Each compartment is connected by piping to the cored valve hub, the face of which is ground to bear against the valve cap. The valve cap is so designed that during a complete revolution each cored opening in the hub registers with the filtrate suction port, the washed liquid port, and the compressed air or steam inlet port.



(Patented)
ZENITH CONTINUOUS ROTARY FILTER

Through the maintenance of a constant level and thorough agitation a uniform mixture is retained in the container at all times.

Zenith Rotary Filters are strongly and substantially constructed, capable of withstanding the hard usage encountered in every day service of the chemical and allied industries.



Ample drainage and pipe areas are provided, thereby securing the maximum filtering force at the filtering medium. All details of the design have been worked out in the light of our extended experience in handling numerous filtration problems.

We have numerous installations of these machines working on acid liquors and on caustic liquors besides a great number of neutral solutions.

Operation As the drum rotates suction is automatically applied to each compartment as that compartment dips into the slurry, and is kept on to the point of discharge. The clear filtrate is drawn through the filtering medium, compartments and the valve to the desired point, leaving the solids deposited upon the surface of the drum in a cake of uniform thickness and porosity, which cake is automatically discharged over the scraper. Washing is accomplished by means of spraying the wash water upon the surface of the cake. Thus during every revolution of the drum the solids are picked up, washed, dried and discharged all automatically and continuously.

The expensive labor of cleaning and operating presses is here eliminated, the life of the filtering medium is greatly extended as there is no abrasion or strain on the cloths and the loss and danger from leaky presses are obviated. This in addition to the low cost of operation and small items of repair and renewal make Zenith Rotary Filters the most efficient machines for the materials for which they are adapted.

(Patented)
ZENITH CONTINUOUS ROTARY FILTERS IN CONSTRUCTION

Adaptations Barbatine, Baghouse Dust, Barium Carbonate, Barytes, Bicarbonate of Soda, Calcium Carbide, Calcium Carbonate, Cement Slurry, Coal Slimes, Cyanamid, Dye Intermediates, Charcoal, Graphite, Lithopone, Nickel Carbonate, Gun Cotton, Oils, Sodium Arsenate, Saccharate of Lime, Salt, Starch, Sulphonates, White Lead, Zinc Oxide, Clays, Paper Pulp, etc.

Features—

1. Automatic and continuous.
2. No labor required.
3. High capacity.
4. Cleanliness of operation
5. Long life of filter cloth
6. Separation of wash water from filtrate.
7. Excellent wash
8. Dry cake
9. Maximum all around efficiency.

Continued on Next Page

ZENITH CONTINUOUS ROTARY HOPPER DEWATERER

This type consists of a series of false bottomed hoppers arranged radially about a central shaft Each compartment is connected by a separate pipe line to a specially designed valve hub which rotates against a stationary valve cap This valve cap is cored into recesses and is connected to suction and pressure lines, suction for filtering and washing, and pressure for discharging

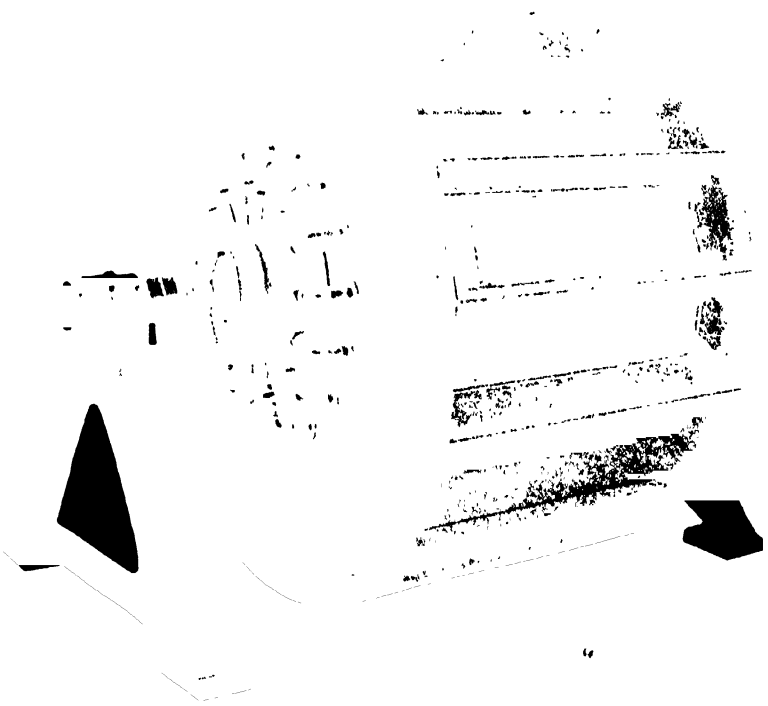
The Zenith Rotary Hopper Dewaterer replaces expensive *power* consuming centrifugals or *cumbersome antiquated* settling tanks by modern inexpensive machinery, operating continuously and automatically

Operation The slurry to be handled is fed to the hoppers, from an overhead chute, as they pass beneath and about 30° before they reach the zenith. Suction which is automatically applied at the zenith is continued to just below the horizontal, where it is automatically cut off and the hoppers discharged by gravity or air or steam pressure Thus as the hoppers revolve they dewater, wash, dry and discharge the solids continuously and automatically at a very low cost of operation

Adaptation This machine is for the filtering or dewatering of coarse or granular particles from a liquid where the separation of solids from liquid is rapid, as in the drawing off of mother liquid from crystals, where the cake formed would be too heavy to be picked up by the rotary filter and such materials as magnetic concentrates, salt, slate, borax shale, sand, copperas, etc

Features -

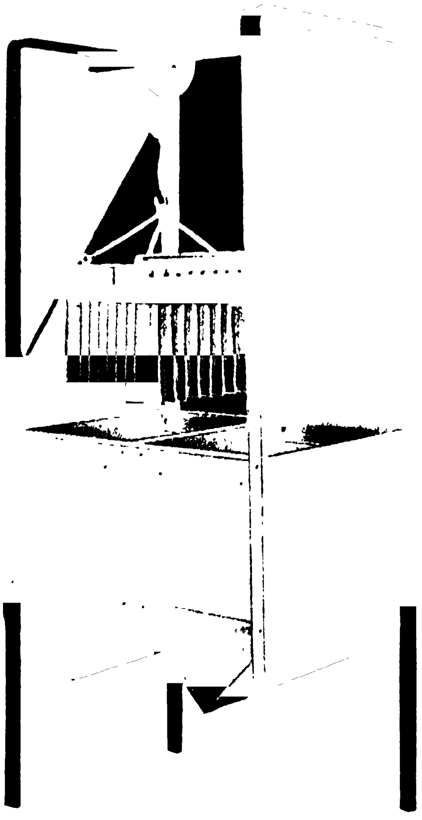
1 Continuous and automatic operation.
2 No manual labor required
3 Very high tonnages per unit
4 Minimum cost per ton of cake
5 Excellent wash with small amount of wash water.
6. Separation of wash water from filtrate
7. Will handle solids of high specific gravity.
8 Items of repair and renewal are reduced to a minimum.



(Patented)
ZENITH ROTARY HOPPER DEWATERER
(IRON CONSTRUCTION)

SERVICE

We maintain a laboratory for the special purpose of testing samples and solving difficult filtration problems



(Patented)
LABORATORY UNIT (Leaf Type)

The wide experience of our chemists and engineers in industrial and chemical filtration is at your disposal Whatever your problems their experience and assistance will be of great value to you

No matter how many installations we have made upon a particular material the varying conditions and methods of production make it always advisable to test samples before making recommendations

A five gallon sample is sufficient for testing purposes All samples should be forwarded to our laboratory, 22 East 16th Street, New York, N Y , accompanied by the information called for on our data sheet

All experiments and tests are made without charge.

PATENTS

The Industrial Filtration Corporation, through its sole agency for the owners of the exclusive rights under the well known Moore filter patents, is in a position to grant exclusive license for industrial filtration in connection with filtration apparatus sold by it for industrial work No additional charge is made by the Industrial Filtration Corporation for this protection.

INTERNATIONAL COOPERAGE COMPANY, INC.

"International" Barrels and Kegs Made With Tongued and Grooved Staves

NIAGARA FALLS, N. Y.

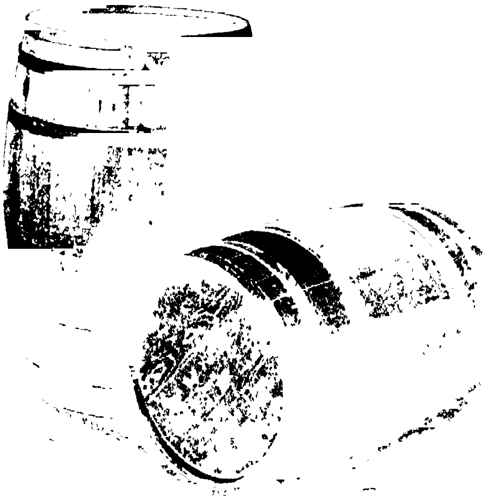
PRODUCTS

Wooden Barrels and Kegs for all Dry Materials.
Cooperage Stock and Tools for all Slack Barrels.

"INTERNATIONAL" BARRELS AND KEGS

We specialize in the manufacture of high grade barrels and kegs which are light and tight and yet made heavy enough to safely carry ordinary weights for both export and domestic transportation. We make them in numerous sizes and in three classes for light and moderately heavy materials with a third or intermediate type for those who want a special barrel of attractive cleanliness, and style to meet some special requirement, or those who want a standard and exclusive package. These barrels are not made for liquids, but will safely hold heavy pastes, greases, plastic cements, and other similar materials where tightness is essential, but where thickness of materials is not necessary for liquids.

There are many manufacturers whose product is valuable and who have a special pride in delivering to customers in first class condition and quantity, that which their production and sales departments have struggled so hard to manufacture and sell. Many of these have had serious and disturbing losses as a result of poor packages, claims to railroads, extra clerical work in traffic departments, extra correspondence, telephoning, and frequently special trips by a sales department representative to see and pacify a disappointed customer—all these and the frequent loss of labor and money can be avoided by using International Barrels and Kegs with tongued and grooved staves.



INTERNATIONAL TONGUED AND GROOVED BARRELS

SIZES

We manufacture all sizes to meet every reasonable need from a small keg holding about five gallons up to large barrels holding about seventy gallons. We also have in various sizes, styles and arrangement of hoops, staves or heading, an assortment of forty-five packages. From this wide variety you can find your particular size.

SERVICE

We operate several branch plants making a variety of sizes to meet the particular requirement of a certain trade. These branch shops are frequently on the premises of manufacturers, who thus have a cooperage department supplying the exact need in quantity and quality without the investment or bother. Where there is a steady use for barrels or kegs, and a little space in the plant can be set aside for cooperage let us talk over with you this economical and dependable cooperage arrangement. You will profit by it.

These branch shops permit us to give unequaled service to many localities not otherwise served by nearby cooperages. We also carry standard sizes of cooperage stock at such shops from which we can ship on quick notice to nearby points. It is certain that we have a branch shop in your vicinity.

QUALITY

We aim to give the best grade of stock and workmanship in our various types and grades. From our tongued and grooved barrel to the cheapest class of barrel each of its class will represent a standard in quality that is unequaled. Our types vary from small kegs suitable for dyes and other valuable pastes or powders to largest sizes of pottery casks.

SAMPLES AND PRICES

Let us discuss your packing problems. Let us show you what poor barrels mean in retarding your development, handicapping your sales department, burdening your traffic department, thus adding to overhead. Losses paid by railroads are charged back to you in freight rates. You simply do the bookkeeping when you credit the railroad with payment of a claim. You pay the price. We will send you samples of what we believe will help you. Prices will always be right under all conditions.

INGERSOLL-RAND COMPANY

Manufacturers of

Compressed Air, Vacuum and Pumping Machinery

GENERAL OFFICES: 11 BROADWAY, NEW YORK, N. Y.

BRANCHES THE WORLD OVER

SALES OFFICES IN UNITED STATES

Atlanta, Ga
Birmingham, Ala.
Boston, Mass
Butte, Mont
Chicago, Ill
Cleveland Ohio
Dallas Texas
Denver Colo
Detroit Mich
Duluth Minn
El Paso, Texas
Houghton Mich
Joplin Mo
Knoxville Tenn
Los Angeles, Cal
New Orleans, La
New York, N Y.
Philadelphia Pa
Pittsburgh, Pa
Salt Lake City, Utah
San Francisco, Cal
Scranton Pa
Seattle Wash
St Louis, Mo
Washington, D C

SALES OFFICES OUTSIDE THE UNITED STATES

Antofagasta Chile
Batavia Neth E Indies
Bombay India
Brussels, Belgium
Budapest, Hungary
Buenos Aires Argentine
Calcutta, India
Christiania, Norway
Cobalt, Ont
Copenhagen Denmark
Dusseldorf Ger
Glasgow, Scotland
Havana Cuba
Honolulu T H
Iquique, Chile
Johannesburg, S A
Juneau, Alaska
Kalgoorlie W Aust
Kobe, Japan
La Paz Bolivia
Lima, Peru
London, England
Madrid Spain
Manchester, England
Melbourne, Aust
Mexico City, D F.
Milan, Italy
Montreal, Quebec
Nelson B C
Paris France
Rangoon, Burma
Rio de Janeiro Brazil
Rotterdam, Holland
Santiago Chile
Secondee, Africa
Semerang, Neth E Indies
Sherbrooke, Quebec
Sourabaya, Neth E Indies
Stockholm Sweden
Sydney, N S, Canada
Sydney N S W
Tokio, Japan
Toronto, Ont
Valparaiso, Chile
Vancouver, B C
Vienna, Austria
Winnipeg, Man

To insure correspondence against avoidable delay, all communications should be addressed to the place nearest the writer

PRODUCTS

- Air Compressors
- Vacuum Pumps
- Air Lift Pumping Systems
- Condensing Plants, Ingersoll-Rand Barometric Type for Steam and other Vapors, Ingersoll-Rand Low Level Multi-Jet and Surface Types
- Direct Acting and Centrifugal Pumps
- Rock Drills
- Pneumatic Tools
- Air Hoists
- Turbo Blowers and Turbo Compressors
- Oil and Steam Engines

INGERSOLL-RAND AIR COMPRESSORS

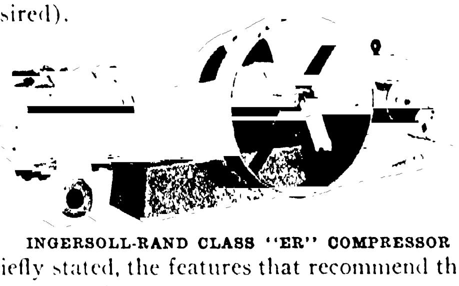
In whatever quantity and at whatever pressure you require compressed air, there is a suitable Ingersoll-Rand Compressor.

The compressors described in detail in these pages are those most likely to be of interest in a majority of instances to the chemical industries. Numerous other types of compressor are included in the Ingersoll-Rand line and if you will let us know the details of your requirements we can usually suggest a suitable piece of equipment from our standard line.

In choosing an Ingersoll-Rand Compressor you have the assurance that your machine is up to the minute in design, highly efficient and truly economical, not only of power, but also of the equally important items of attendance and upkeep.

INGERSOLL-RAND CLASS "ER-1" COMPRESSOR

These are horizontal, double-acting, single-stage machines and represent a unit having automatic lubrication and regulation requiring a minimum of care and attention. They may be driven from line shaft, individual motor or gas engine (with short belt drive if desired).



INGERSOLL-RAND CLASS "ER" COMPRESSOR

Briefly stated, the features that recommend this type to the users are:

Automatic Splash Lubrication, by means of which all driving parts are copiously and automatically oiled. Sight feed lubrication for air cylinders.

Liberal Bearing Surfaces have been provided to insure smooth running.

Complete and Liberal Water Jacketing of air cylinders

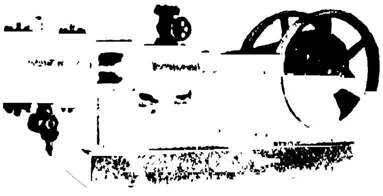
Enclosed Construction with Removable Covers makes for cleanliness along with accessibility.

Heavy One-Piece Main Frame lends rigidity to the entire machine.

Foundation is the Simplest Imaginable, making the machine easy to install.

Ingersoll-Rand Plate Inlet and Discharge Valves provide for the admission and discharge of the maximum air volume. They are silent in operation and long lived. Scarcely ever require attention and are entirely independent of any driving mechanism

Capacities 28 to 955 cu ft per minute, pressures 10 to 110 lbs per square inch. Bulletin No 3330.



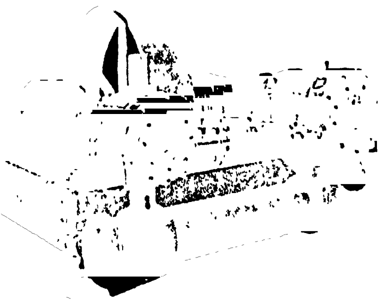
INGERSOLL-RAND CLASS "FR-1" COMPRESSOR

For corresponding steam driven units the Company offers its Class "FR," which is identical with the Class "ER" described above, it being direct connected to steam engine having balanced piston valve with automatic cut-off fly wheel control governor, making it possible to operate with high pressure and superheated steam, as well as with moderate pressures and saturated steam.

These are offered in capacities between 67 and 1086 cu ft per minute at pressures from 10 to 125 lbs per sq in Bulletin No 3131

"IMPERIAL" TYPE XB AIR COMPRESSORS

Duplex power driven types, machines of single or two-stage construction. May be run from any available motive power or can be furnished at extra cost with short belted electric motor drive—including endless belt, floating idler attachment and foundation bolts



"IMPERIAL" TYPE XB DUPLEX POWER DRIVEN COMPRESSOR

Several exclusive features characterize these machines, among which the following may be emphasized:

Automatic Splash Lubrication which supplies the right amount of oil to all parts at all speeds.

The Main Bearings are an integral part of the frame.

Continued on Next Page

Complete and Liberal Water Jacketing insures efficient [illegible]

Enclosed Construction, having entire running gear, with removable covers making unit readily accessible

Centrally Hung Driving Wheel evenly distributing weight of machine over entire foundation

Heavy and Substantial Main Frame making the machine a solid and self-contained unit

Air Cylinders Bolted to Frame are in no way dependent upon the foundation for correct alignment

Capacities 198 to 3508 cu ft per minute, pressures from 15 to 100 lbs per square inch Bulletin No 3312

"IMPERIAL" TYPE XPV COMPRESSOR

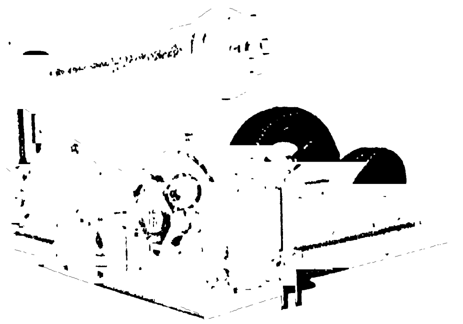
"IMPERIAL" TYPE XPV COMPRESSOR

The "Imperial" Type XPV Compressors are of duplex, single or two-stage construction and are equipped with balanced piston steam valves suitable for high steam pressures and superheat as well as for saturated steam. These compressors are furnished with automatic cut-off governor.

Built in capacities ranging from 668 to 5155 cu ft per minute, pressures from 15 to 110 lbs per sq in Bulletin 3033

CLASS "PRE" AIR COMPRESSORS

Ingersoll-Rand Class "PRE" Compressors are duplex, single or two-stage units having electric motor direct-connected to compressor shaft. Regularly fitted with patented automatic 5-step clearance control.



INGERSOLL-RAND CLASS "PRE" COMPRESSORS

Standard duplex construction lends itself to a most advantageous design, with the motor placed between the bearings, the rotor being securely pressed and keyed on the compressor shaft. The illustration above gives a clear idea as to the general, compact and massive construction adopted.

Other "PRE" features includes: automatic lubrication, dust proof enclosed construction, Ingersoll-Rand plate inlet and discharge valves and intercooler.

Capacities from 627 to 7817 cu ft per minute, pressure 15 to 110 lbs per square inch. Bulletin No 3126

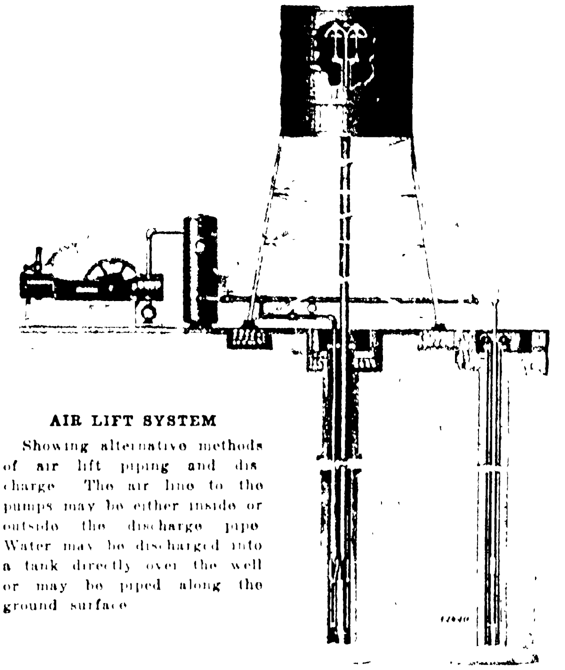
THE AIR LIFT SYSTEM OF PUMPING

The Air Lift System of elevating liquids has reached a stage of engineering development that warrants the attention of operating men who are contemplating installing pumping equipment. It has

Utility	Simplicity and Reliability
Unlimited capacity	Low Maintenance Cost

Owing to the high state of efficiency now obtainable by means of the Air Lift, the scope of its application has been widely extended.

It is recognized as a superior method of elevating water for cooling and condensing, acids and alkalis for chemical processes, as well as vegetable and mineral oils, solvents, dye liquors, trade wastes, and a number of other liquids used in the industries.



AIR LIFT SYSTEM

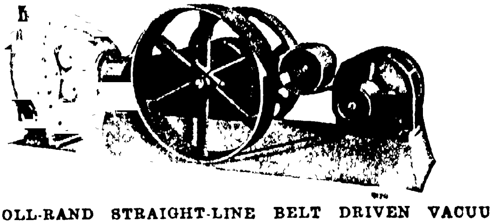
Showing alternative methods of air lift piping and discharge The air line to the pumps may be either inside or outside the discharge pipe Water may be discharged into a tank directly over the well or may be piped along the ground surface

The strong features of the Air Lift are that there are no moving parts in the well or source of fluid supply. All machinery needed is contained in the air compressor located at any point where the expense of attendance is least, or where it is most convenient to place it. Flexibility in the location of the power plant is one of the most striking features of the Air Lift installation, since the loss in transmitting air is negligible, providing the pipe lines are properly designed and laid.

Our engineers are specialists in laying out the proper Air Lift System for the work required, and they are at your service.

INGERSOLL-RAND VACUUM PUMPS

Ingersoll-Rand Vacuum Pumps are suitable for every requirement of the chemical industries where a reliable and efficient **dry** vacuum pump is needed. They combine large capacity with minimum space requirements, and are largely automatic in their action, reducing supervision to a minimum.



INGERSOLL-RAND STRAIGHT-LINE BELT DRIVEN VACUUM PUMP

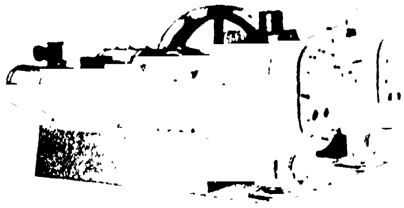
Various types can be recommended adapted to operation of condensers, vacuum dryers, vacuum stills and kettles, impregnating equipment, paper mill machinery, laboratory vacuum installations, etc.

These pumps are all capable of maintaining a high vacuum and can be arranged for discharge pressures of several pounds.

Continued on Next Page

Ingersoll-Rand straight line power and steam driven vacuum pumps are single-stage, double-acting having vacuum cylinders fitted with Ingersoll-Rand plate valves. The power driven units can be furnished with or without short belt drive and electric motor. The steam driven unit is furnished with piston steam valve which permits the use of superheat and high steam pressure as well as saturated steam, and also with adjustable speed throttling governor.

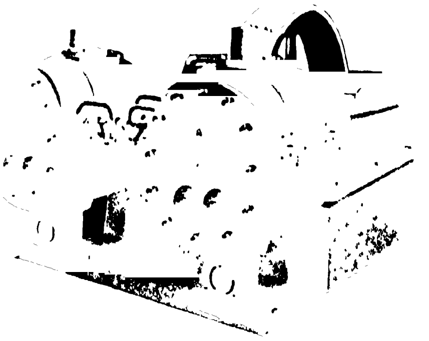
Built in capacities ranging from 292 to 2295 cu. ft. per minute. Bulletin No. 3137.



"IMPERIAL" DUPLEX STEAM DRIVEN VACUUM PUMP

"Imperial" duplex belt and steam driven vacuum pumps are single-stage and double-acting, but for special work where unusually high vacuum is required the cylinders may be connected in series. Belt driven units can be furnished for short belt drive to electric motor. Steam driven units have "D" steam valve with fixed cut-off and the larger sizes, Meyer valve gear or with "Imperial" balanced piston steam valves of the telescopic type. The latter unit is especially adopted for high steam pressures and high superheat as well as for ordinary steam conditions.

Built in capacities ranging from 1048 to 5571 cu. ft. per minute. Bulletin No. 3138.



"IMPERIAL" DUPLEX BELT DRIVEN VACUUM PUMPS

INGERSOLL-RAND CONDENSING PLANTS

A condensing plant consists of a suitable condenser, together with the necessary accessories.

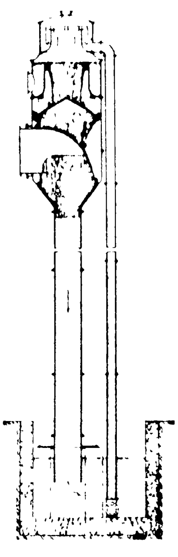
The Ingersoll-Rand Company builds a variety of condensers, vacuum pumps and water pumps, and can supply a suitable condensing plant to meet any set of service conditions.

Ingersoll-Rand condensing plants are today operating successfully in hundreds of installations in connection with steam engines, turbines, evaporators, vacuum pans, stills, dryers, continuous filters and other machinery.

Ingersoll-Rand Barometric Type Condensing Plants—This type of plant consists of a barometric condenser (patented) of simple and efficient design together with a suitable dry vacuum pump, and a Cameron Centrifugal Circulating Water Pump, together with the necessary connections.

TWO NO. 10 I. R. BAROMETRIC CONDENSERS

Serving turbines at a large Pennsylvania plant. 28" vacuum is maintained with 70 deg. cooling water and each condenser handles 15,000 lbs. of steam per hour.



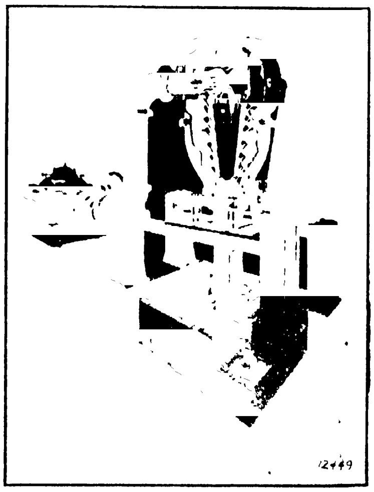
SECTIONAL VIEW OF AN INGERSOLL-RAND BAROMETRIC CONDENSER

This type of installation operates on the "dry system," i.e., the air and water are removed separately. It is of the counter-current type, insuring the discharge of the air and vapor at the lowest practical temperature. The cooling water is removed automatically, obviating pump troubles and the use of vacuum breakers. The vacuum and water pumps are independently operated by prime-movers separate from the main unit (when the condenser is used in connection with engines and turbines). These prime-movers may be steam, belt drive or electric motors. Bulletin No. 9224.

Ingersoll-Rand Low Level Multi-Jet Condensing Plants—This type is suitable for many installations in which compactness and simplicity are major considerations.

Unlike many jet condensers it requires no water-removal pump at the base of the condenser nor is an air pump needed under any condition. The water is injected into the condenser at a pressure of about 9 lbs. per sq. in.

The Ingersoll-Rand Low Level Multi-Jet Condenser has a number of converging jets of water which condense the steam and also eject the air and non-condensible vapors. The steam is admitted through a top inlet or side inlet nozzle as desired to suit local conditions. Bulletin No. 9032.



COMPLETE MULTI-JET CONDENSING PLANT

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CAMERON DIRECT ACTING AND CENTRIFUGAL PUMPS

CAMERON DOUBLE SUCTION VOLUTE CENTRIFUGAL PUMP

illustration the pump we for water ation with Condensing There is a on Pump for fluid handling em For com- range of sizes types see Bul- 7252, 7304, 7350, 7351.

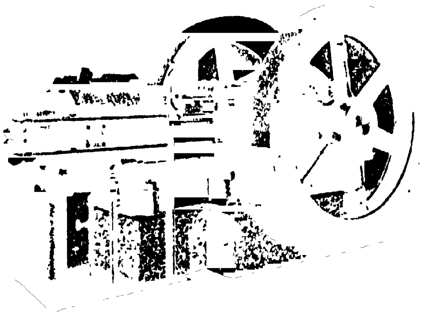
HORIZONTAL AND VERTICAL OIL ENGINES

The Price "PO" single cylinder horizontal and "PR" multi-cylinder vertical oil engines will furnish satisfactory power for all general purposes and represent the highest developments of American oil engine manufacture.

They operate on four-stroke cycle with mechanical self-injection of fuel without the aid of compressed air. Ignition is solely by temperature of compression and no hot bulbs or plates are used, the cylinder and heads being entirely water jacketed.

The engines will operate on any clean, commercial crude oil, that is sufficiently fluid to flow freely at engine room temperature. Price oil engines have the economy of the Diesel engine and the simplicity of the steam engine.

Horizontal Stationary Type "PO"—45 and 90 H. P.
Vertical Stationary Type "PR"—105-1000 H P.
Full information on request.


INGERSOLL-RAND (PRICE TYPE) "PO" HORIZONTAL OIL ENGINE

HAND HAMMER ROCK DRILLS

Ingersoll-Rand "Jackhamers" are one-man, compressed air or steam operated. They are light yet steady and rapid hand-held rock drills and extremely useful for drilling rock, concrete, masonry, etc., when digging ditches, putting in foundation bolt holes and similar work. Bulletin No. 4046.

For such work as tearing up concrete flooring, breaking down slag or ash piles, and similar demolition work the Ingersoll-Rand Paving Breakers will prove time and money savers. These are one-man machines and operated by compressed air. Bulletin No. 4051.

PNEUMATIC TOOLS

"Little David" chipping, scaling and calking hammers, core breakers, riveters, holders-on and jam riveters, drills, including close quarter types, wood boring machines, flue rollers and portable grinders, hoists and stationary motors, sand rammers and calking machines, drift bolt drivers. Tools to suit every requirement.

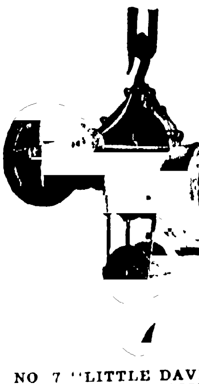
They typify superiority in design, workmanship and material and are distinguished by a large capacity for work with small air consumption Bulletin No 8000.

PNEUMATIC HOISTS

LITTLE TUGGER HOIST

The "Little Tugger" Hoist is a labor and time saver whose value is unlimited, as it may be used for many lifting, handling and hauling jobs. They are built in two sizes and six types which can be supplied for operating by either air or steam These sizes differ only in size of drum and base, which change accommodates the use of manilla rope. They are simple to mount and weigh from 125 to 500 lbs. less than other hoists having similar capacity and are self-contained, which affords their being set up and taken down quickly. The base of the hoist is arranged so it can be bolted to a timber or other convenient place. Bulletin No. 4333.

TYPE	No 1 H & 1 HS	No 11 H & 11 HS
Weight, less Cable	285 lbs	358 lbs
Width	21¼ in	31¼ in
Length	16½ in	21½ in
Height	20⅜ in	23 in
Size of Drum Rope Space dia	6 in	7 in
Size of Drum, between Flanges length	7 in	17 in
Depth of Flanges	3 in	5 in
Rope Capacity	¼ in 700 ft 5/16 in —450 ft	7/8 in 300 ft
Rope Speed	85 ft per min	85 ft per min
Hoisting Capacity at 80 lbs Pressure	1000 lbs	600 lbs
Horse Power	2½	2½
Hose Recommended	¾ in	¾ in


NO 7 "LITTLE DAVID" AIR MOTOR HOIST

For short lifts of 20 ft. and less, the "Little David" motor hoist is offered, which is built in five sizes, having capacities of ½, 1, 2, 3½ and 5 tons. Important facts about the "Little David" motor hoist are tabulated below. Bulletin No. 8206.

"LITTLE DAVID" MOTOR HOISTS

Size No	Capacity Lbs	Feet Lift per Min 80 lbs Pressure	Maximum Lift Feet	Size and Length Wire Rope	Net Weight Lbs
1	1000	32	20	¼"x11' 0"	270
2	2000	16	20	¼"x11' 0"	280
4	4000	8	20	5/16"x11' 10"	395
7	7000	8	20	⅜"x98'- 6"	785
10	10000	7	20	⅜"x98' 6"	785

THE "CLINKERBREAKER"

The "Clinkerbreaker" is a compressed air operated tool for rapidly, efficiently, and economically breaking down for removal hard clinkers such as are formed in gas generators.

This machine delivers many hundreds of forceful blows per minute to the steel which will break down the hardest clinker so that the fires may be run to obtain maximum gas output. The removal of the clinker can be absolutely controlled. This prevents the fires from dropping prematurely, thus saving fuel. Full information on request.

INTERNATIONAL ENGINEERING WORKS, Inc.

INCORPORATED UNDER THE LAWS OF MASSACHUSETTS

Steel Plate Construction and Steam Boilers

MAIN OFFICE AND WORKS

FRAMINGHAM, MASS.

BOSTON, Board of Trade Building, Rooms 1029-1030

PRODUCTS

All forms of Steel Plate Construction required for:

- Paper and Textile Mills
- Chemical and Rubber Plants
- Slaughtering and Rendering Establishments
- Cold Storage and Refrigeration Plants

Open and Closed Tanks of all descriptions including:

- Digesters and Kiers
- Vulcanizers
- Rendering Tanks
- Mixing Tanks
- Jacketed Kettles and Jacketed Tanks

All types of Externally and Internally Fired Fire-tube Boilers for Power and Heating Purposes including:

- Horizontal Return Tubular and Vertical
- Locomotive and Scotch Marine

Guyed and Self Supporting Steel Stacks
Smoke Flues and Breechings
Penstocks and Flumes
Horizontal Water Tube Boilers

PLANT AND EQUIPMENT

The Plant of this company comprises buildings of modern construction designed expressly for the manufacture of steam boilers and the fabrication of all forms of steel plate construction, fully equipped with the requisite tools and labor saving devices necessary for the efficient execution of the work.

The works include a pattern shop, machine shop, steel plate and light iron shops, and a forge shop. In addition to the usual tools required in these departments the equipment of the plant includes electric welding apparatus and a large hydraulic press making it possible to execute the most intricate forms of construction in an entirely satisfactory manner.

SERVICE

The knowledge acquired in dealing with numerous problems involving steel plate construction and extending over a period of more than 60 years places this company in an exceptional position to serve its patrons intelligently

A competent staff of engineers, with practical knowledge of available materials, will prepare working drawings for apparatus to meet special conditions, thereby effecting a considerable saving in the cost of the equipment as well as the time required to complete the installation

An efficient cost system forms a basis for reliable estimates, and expert supervision of the work in all its branches insures the highest quality of workmanship and the completion of all contracts within the time specified.

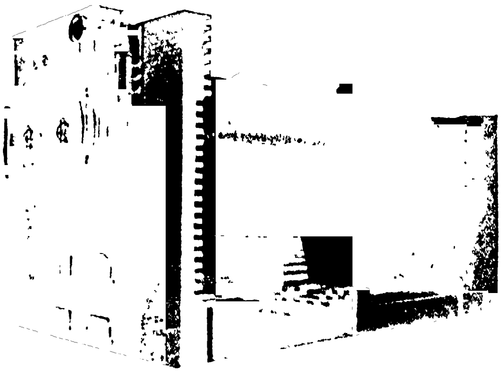
SPECIAL APPARATUS

The illustrations on the opposite page represent only a few examples of equipment used in the chemical industries which this company is prepared to furnish.

The facilities available at this plant for the construction of equipment requiring special castings or an unusual amount of machine work are unexcelled, and insure the satisfactory handling of such work

STEAM BOILERS

This company manufactures all types of fire-tube boilers to comply with the code established by the A S M E or in accordance with whatever local regulations may govern the installation of steam boilers or other pressure vessels



HORIZONTAL RETURN TUBULAR BOILER

All boilers are carefully inspected and tested before shipment and the purchaser is furnished with the customary insurance against defects in material or workmanship.

A large stock of raw material makes it possible to fil orders for all standard sizes of horizontal return tubula and vertical boilers promptly, many of which are carried in stock for immediate shipment.

BRADY TYPE SCOTCH BOILER

The accompanying illustration shows a type of inte nally fired boiler developed by this company which ha proved most efficient and especially adapted for servic where brick set boilers cannot be installed to advantag

Continued on Next Pag

REFRIGERATION PLANTS

Equipment for both the Absorption and Compression systems of refrigeration has been specialized in, and various types of apparatus have been designed. Generators as illustrated, Condensers, Liquor Receivers and Absorbers of varying sizes to meet the demands of systems.

ABSORPTION SYSTEM GENERATORS

RUBBER MACHINERY

Rigid, belt driven rubber churns containing paddles with a pitch that insures an even mixture. These churns are equipped with a patent non-leakable cover to prevent evaporation of the volatile oils.

CARLOAD OF MIXING TANKS

Rubber Vulcanizers with quick opening heads eliminating the usual loss in time in loading and emptying. These Vulcanizers are equipped with car and truck and built either jacketed or plain.

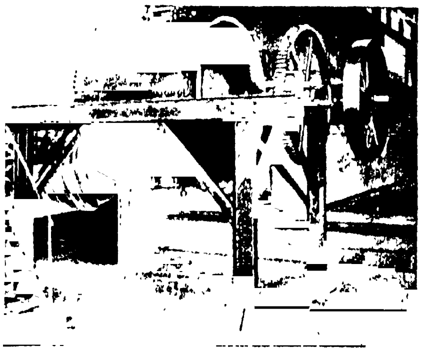
Devulcanizers are built either revolving or stationary. The jacketed revolving Devulcanizer carries steam to the jacket through one of the bearings equipped with a special gland and packing chamber to prevent leakage.

JACKETED RUBBER DEVULCANIZER

RENDERING PLANTS

Conical bottom tanks where cooking by steam is required are made which are especially adapted to Rendering and Soap Manufacturing Plants. These tanks are equipped with quick opening covers. Designed for varying pressures to meet different requirements.

RENDERING TANK



JACKETED MIXING TANK

CHEMICAL WORK

Special churns and mixers for chemical work. Vats, tanks, churns and mixers. Illustration shows a stationary tank set on a framework with the paddle unit driven through the train of gears.

MIXING TANK

INTERNATIONAL EQUIPMENT COMPANY

352 Western Avenue, Brighton
BOSTON, MASS.

Catalog C 5

PRODUCTS

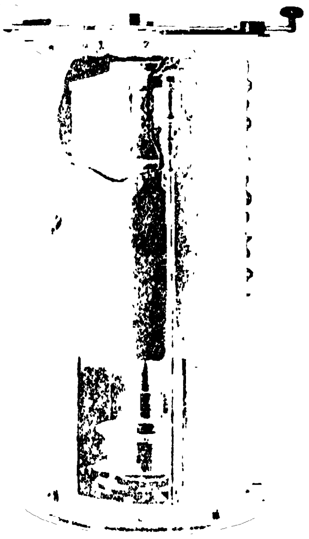
Laboratory and Commercial Centrifugals, Bottle Shakers, Kjeldahl Stills, Fabric Washing Machines.

CENTRIFUGALS, COMMERCIAL

For belt-drive from power shafting, or with electric motor attached. Baskets, being under driven, have full open top. Usual construction, steel or tinned copper with reenforcing steel bands. Draining chambers of cast iron. When necessary, draining chambers may be lined with sheet lead or block tin. Baskets may be lined with sheet lead or hard-rubber covered.

Regular sizes, 15, 20, 26, 30 inches diameter of perforated basket.

Friction Pulley supplied with sizes above 20″ diameter. Foot brake attached to all sizes.



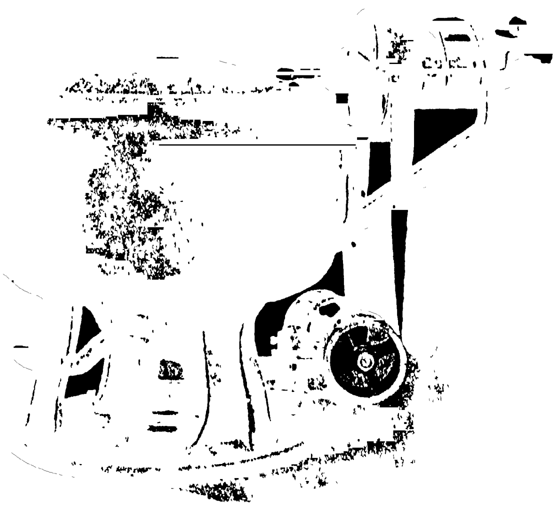
HIGH SPEED CENTRIFUGAL

CENTRIFUGALS, SPECIAL, HIGH SPEED

Baskets 5″, 8″, 11″, 14″ diameter.

For Research and Experimental solution of Production Problems.

In asking for details of our machines, give us information regarding the nature of your problems.

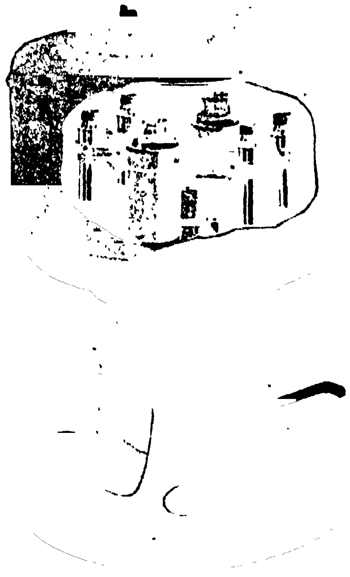


COMMERCIAL CENTRIFUGAL

The baskets are self-balancing, the shafts being free to rock on a ball seat at the center of the driving pulley, but controlled and confined against excessive freedom by the Crawford Rubber Stand, a practical device for steadying the Centrifugal shaft by a sleeve bearing attached to a rubber compression chamber.

The moving parts are machined and balanced to run true and without vibration.

Correspondence solicited.



ANALYTICAL CENTRIFUGAL

CENTRIFUGALS, ANALYTICAL

In several sizes, with variety of equipment. Tubes varying from 15 c.c. to 250 c.c. capacity. Wide range of speed variation. Electric motors direct connected on Centrifuge shaft.

INTERNATIONAL OXYGEN COMPANY

NEWARK, N. J.

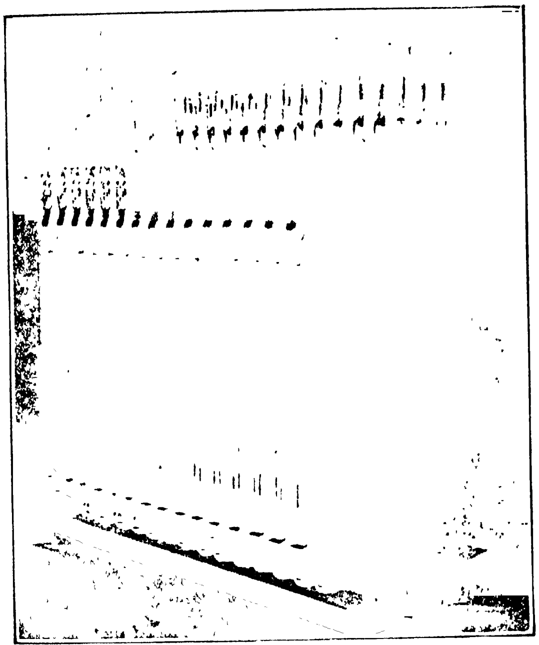
U. S. Plants and Offices New York N. Y. College Point N. Y. Pittsburgh Pa. Verona Pa. Toledo Ohio Chicago, Ill., London and Paris

PRODUCTS

Generators for Oxygen and Hydrogen; Pressure Regulating and Reducing Valves for high pressure gases; Gas Testing Apparatus and Cylinders; Distilling and Hydraulic Testing Apparatus; Pure Oxygen, Hydrogen and Nitrogen gases in cylinders; Anhydrous Ammonia; Cylinder Stud Valves.

SERVICE

The organization takes in the requirements of the entire field of oxygen and hydrogen users. It manufactures unit oxygen and hydrogen generators for any quantity of gas needed, designs and constructs complete Oxygen, Hydrogen and Synthetic Ammonia Plants.



BANK OF 16 I. O. C TYPE 4—1000 OXY-HYDROGEN GENERATORS

I. O. C. TYPE 4—1000 OXY-HYDROGEN GENERATOR

These generators of the unit or single cell type have set a new standard of economy in gas production.

Each generator is complete in itself, making pure oxygen and pure hydrogen at a rate determined by the amperage of the electric current supplied.

Each unit requires floor space of 4″ x 42″ or about the equivalent of a square foot and with necessary pipe connections needs head-room of about 7 feet. The normal capacity of this generator per unit of floor space is 200% greater than any other apparatus on the market.

Practically no organic material enters into its construction. There are no moving parts, therefore no wear. The materials used are time proof and immune to chemical action or deterioration.

ELECTRICAL EFFICIENCY

At normal current of 1000 amperes each cell, with an electrolyte of caustic potash solution, requires 2.1 volts and has a guaranteed capacity of 8 cu. ft of oxygen and 16. cu. ft of hydrogen per clock hour. The electrical efficiency is 3.75 cu ft of oxygen and 7.5 cu ft of hydrogen per kilowatt hour.

Below 1000 amperes a slightly higher electrical efficiency is obtained but the gas output per cell diminishes. Above 1000 amperes the electrical efficiency diminishes slightly while the output per cell increases.

When the demand falls below normal, current can be saved by running the plant on a lower amperage, thus securing the smaller gas output needed at a higher electrical efficiency. As gas requirements increase, a higher amperage can be used and a larger output secured.

It is practical to operate at a range varying from less than 200 amperes to upwards of 1200 amperes—or at a ratio of more than 1 to 6

CAPACITIES—I. O. C. TYPE 4-1000 UNIT GENERATORS

Number of Cells	Capacity in Cu. Ft. per 24 Hours At 1000 Amperes	
	Oxygen	Hydrogen
25	4800	9600
50	9600	19200
75	14400	28800
100	19200	38400
150	28800	57600

PURITY OF GASES

I. O. C. Type 4—1000 Generators are guaranteed to produce gases of a minimum purity of 99.5% for oxygen and 99.75% for hydrogen. Experience, however, shows oxygen averaging 99.7% pure and hydrogen over 99.9% pure.

I. O. C. ENGINEERING SERVICE

The Company designs, installs, and puts into operation oxy-hydrogen plants complete in every detail—not alone I. O. C. generating apparatus but also such accessories as motor-generators, switchboards and control apparatus, compressors, gas holders, piping systems, and apparatus for utilizing the gases.

Or the Company will, in connection with the purchase of its own apparatus, prepare plans for the complete installation and furnish specifications covering all accessories—with a view to safeguarding the purchaser's interests at every point.

IRVING IRON WORKS COMPANY

IRVING SUBWAY TRADE MARK PATENTED
THE FIREPROOF VENTILATING FLOORING

Dutchkill Creek and Third Street
LONG ISLAND CITY, NEW YORK
Telephone Hunters Point 3312

IRVING SAFSTEP TRADE MARK PATENTED
ABSOLUTELY NON SLIPPING ALWAYS

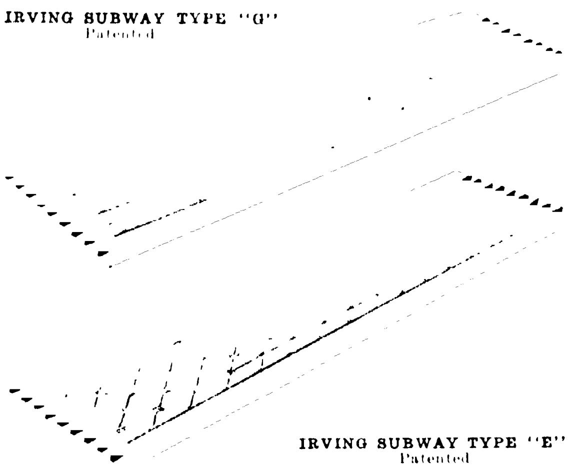
PRODUCTS

Sole Manufacturers of Irving "Subway," "Sunway," "Reticuline," "Eggcrate," "Honeycomb," and other forms of grating, grating-flooring, and grating-flooring accessories; Irving "Safstep" Stair Steps; Irving Walkways; metal accessories for chemical, dye, power, pumping, and industrial plants.

TRADE-MARKS

The trade-marks "Subway," "Sunway," "Safstep" and "Reticuline" are registered in the U. S. Patent Office, are the exclusive property of this company, and cannot legally be used in connection with any grating or grating-flooring product made by any other company.

IRVING SUBWAY TYPE "G"
Patented



IRVING SUBWAY TYPE "E"
Patented

CONSTRUCTION

Irving Subway consists of a series of light steel bars placed on edge, between each pair of which a reticuline bar is placed and firmly riveted in position. The finished section is a light but inflexible panel embodying the well-known truss principle of construction, by which a load applied at any point is at once distributed over a wide area. Maximum strength is thus secured with the minimum weight of material. When riveted up, each section of Irving Subway is, in all essentials, a solid unit in which there is, and can be, no looseness, no play, no rattling.

TYPES

There are two standard types of Irving Subway, differing in appearance and in price, but not in strength or general merit. In Type "G" the crimp of the reticuline bars is elongated, with a spacing of 7 inches between rivets, resulting in a panel with comparatively large openings—"open mesh," to use a common term. In Type "E" the crimp in the reticuline bars is shorter and rivet spacing 3½ inches—resulting in a panel of smaller openings and "close mesh." The rated load capacity is the same for both Type "G" and "E." Choice between them in any case is to be determined by the factor of size of mesh.

EXCLUSIVE ADVANTAGES

Briefly summarized, Irving Subway offers the following exclusive advantages over any other form of grating or grating-flooring:

Maximum strength per unit of weight: minimum weight per unit of load and span; uniform distribution of load by truss construction; minimum deflection per unit of load and span, maximum lighting and ventilation area (80% of panel area); absolutely non-slipping surface; cannot become loose and rattly; oil or greaseage or wear, does not impair its non-slipping qualities; minimum lodgment for dirt or solid objects small size of individual openings (mesh) prevents passage of tools, etc.; wheels or rib-hooped barrels can be rolled over it in any direction without going through its light weight means minimum weight and cost of the supporting structure; safe, comfortable and noiseless to walk or work upon, safe to work under, because nothing large and heavy can fall through it; openings for pipes, columns, etc., can be cut out without seriously impairing the strength of the panel; easily fitted into corners or formed in irregular shapes without impairment of strength; while affording maximum opening for lighting and ventilation, the depth of the bar members obstructs vision except when directly beneath; easily mounted or attached to any type of construction by means of specially devised fasteners—no drilling, no tapping, no bolts or screws needed.

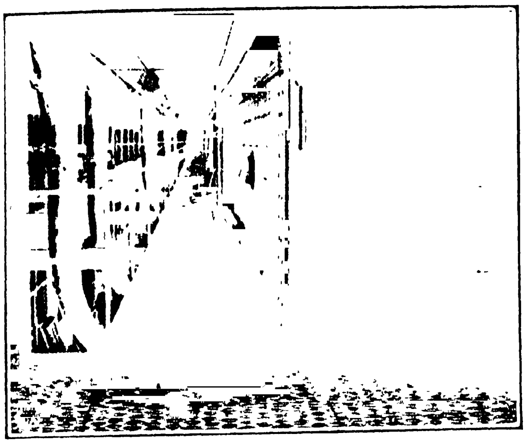
USED AS AN OPEN FLOORING IN CHEMICAL AND INDUSTRIAL PLANTS, IRVING SUBWAY IS EASILY ADAPTABLE TO EVERY REQUIREMENT

INDUSTRIAL APPLICATIONS

In the industrial world, the question of flooring is intimately identified with that of plant and production efficiency. The preeminent advantages of Irving Sub-

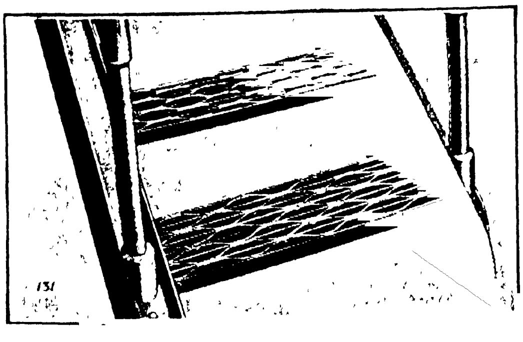
Continued on Next Page

have led to its use by engineers in ever-increasing quantities for industrial purposes, some of its applications being as follows: Floors, walkways, and galleries in power plants; boiler room floors in oil-fired plants; pump platforms; covering for turbine pits, pipe trenches, and drainage sumps; floors for mine cages, freight elevators and elevator pent houses, floors or platforms around tanks or vats; charging floors, floors in gas plants and retort houses; a substitute for water-cooled plates affording maximum area; armoring of concrete surfaces; stair and ladder steps, etc. As a removable mat over a floor in laboratories or other places where sand or plaster might fall and be ground under foot and be tracked about, it offers peculiar advantages.



A GALLERY OF IRVING SUBWAY AROUND THE FURNACES IN A CHEMICAL MANUFACTURER'S PLANT

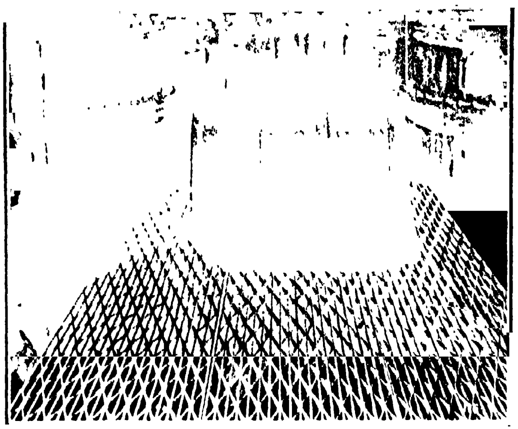
A remarkable fact about Irving Subway is that its adoption in a plant for a specific and probably obvious purpose, has almost invariably been followed by its application in the same plant for many totally different and less obvious purposes. In fact, each month seems to bring forth new applications never thought of before.



A STAIRWAY OF IRVING "SAFSTEPS" IS SAFE AND NON-SLIPPING UNDER ALL CONDITIONS

IRVING "SAFSTEP" STAIR STEPS

Originally a special application of Irving Subway, these "Safsteps" have gained such popularity that they are now a standard product in the Irving line. Each step is a complete unit, with its own carriers, easily installed and more durable than any other step. You never have to "watch your step" on a ladder or stairs with Irving "Safsteps." They are absolutely non-slipping, even with oil or grease upon them. When used out of doors they cannot accumulate snow or ice (as a solid step does) give a secure footing even in freezing weather. They cannot fill up with dirt, and are clean and sanitary.

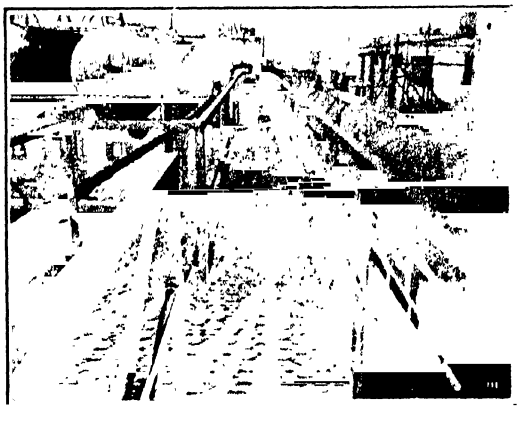


RIB HOOPED BARRELS ROLL OVER IRVING SUBWAY AS EASILY AS OVER A SMOOTH, SOLID FLOOR

They're strong enough for any load that may come upon them—yet so light that they need only the lightest supports. This means a big saving in first cost and in dead weight. Irving "Safsteps" are an effective form of accident insurance in any plant.

CATALOG

Catalog No. 3A2, sent on request, gives complete description, load rating, sizes, spans, weights and all other data—together with a list of representative users, reports of tests, and details of various applications.



A CAR LOADING PLATFORM OF IRVING SUBWAY IN A CHEMICAL PLANT—NON-SLIPPING UNDER ALL CONDITIONS

ISBELL-PORTER COMPANY

Machinists, Founders, and Contracting Engineers

Cable Address
"BELLPORT"

16 BRIDGE ST., NEWARK, N. J.

PRODUCTS

Charging and Discharging Machinery and Conveyors for Hot Materials.

Woodall-Duckham System of Vertical Retorts.

Ring Furnaces; Governors and Compensators; Washers, Extractors and Scrubbers; Coolers; Purifiers; Unger Ammonia Concentrators, Aqua and Sulphate Plants; Gas Valves; Special Castings, Fittings, etc.

WOODALL-DUCKHAM SYSTEM OF VERTICAL RETORTS

These retorts are adapted for the production from soft coal of a mixture of coal and water gas of about 450 B.T.U.'s which is free from dust and tar. This gas can be used in all industrial furnaces without preheating air for combustion. These retorts are also used extensively for calcining or "shrinking" petroleum coke in the manufacture of carbon electrodes and are equally applicable to the calcination or reduction of many other materials where temperatures of not over 1350° C. are required.

Fully described in bulletin "G."

RING FURNACES

These furnaces are especially adapted for the baking of fragile materials requiring gradual heating and cooling and a baking heat of not over 1100° C.

GOVERNORS AND COMPENSATORS

The Isbell Exhauster Governor regulates the speed of the exhauster engine by the make or pressure of the gas, preserving under all circumstances perfect uniformity of pressure on the retorts. It consists of a balanced piston steam valve connected by means of a lever with the holder or float which rises and falls with the varying pressure of the gas admitted to it through a pipe leading from the inlet side of the exhauster.

We also build compensators for use in connection with exhausters which are operated by motors, where it is not practicable to vary the speed to maintain constant inlet pressure.

Our compensator consists of a tank partly filled with water and containing a float attached to a balanced valve. A small pressure pipe leading from the inlet side of the exhauster admits the gas to the under side of the float, and any variation in the pressure of th gas causes the float, and consequently the valve t move. If the pressure falls, the valve opens and allow a certain portion of the gas to pass back to the inl side of the exhauster until the desired pressure is re established.

Described in detail in Bulletin "B."

WASHERS, EXTRACTORS AND SCRUBBERS

We furnish immersion washers, P and A. extractors and tower and rotary scrubbers for the removal of vapors from gases under light pressures.

COOLERS

Made of steel or cast iron for the cooling of gases under light pressures using either fresh or salt water.

PURIFIERS

Complete installations for the removal of sulphur compounds from gases under light pressures.

UNGER AMMONIA CONCENTRATORS, AQUA AND SULPHATE PLANTS

The concentration of ammoniacal liquor is necessary in order that it may be shipped to places where the ammonia is converted into products used in the industries. Even when an ammonia refinery is situated in close vicinity to gas works, it pays the gas producer to convert the liquor into concentrate.

Complete description in Bulletin "D."

GAS VALVES

The Isbell gas valve has double gates and hand holes for cleaning on both sides. It is made entirely of iron for pressures up to 10 pounds, in sizes from 3″ to 48″ inclusive with either inside or outside screws. In opening the valves inclined surfaces at the top of the gate holder draw the gates together breaking contact with the seats. In closing, a toggle in the center of the gate holder forces the gates against their seats.

Where valves are required to operate frequently, and open and close instantly they can be furnished with lever, hydraulic or pneumatic cylinder, or with a variety of forms of special gearing.

Detail description in Bulletin "F."

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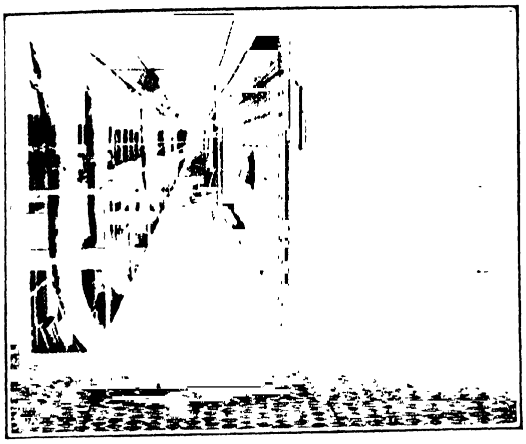

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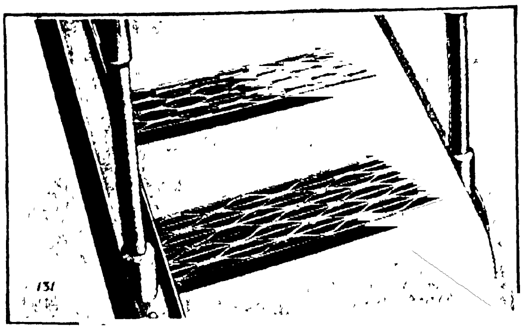

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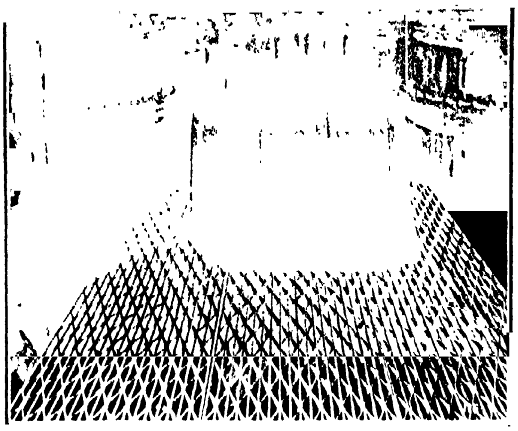

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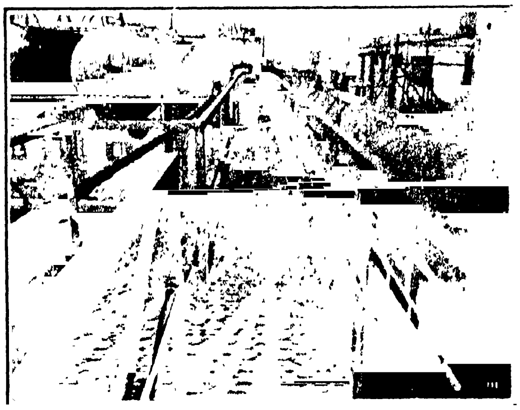


A CAR LOADING PLATFORM OF IRVING SUBWAY IN A CHEMICAL PLANT—NON-SLIPPING UNDER ALL CONDITIONS

H. JACKSON PUMP AND MFG. CO., INC.

Manufacturers and Patentees Pumping Outfits
95 SECOND AVE., BROOKLYN, N. Y.

Telephone
6791 SOUTH

PRODUCTS

Hand, Power and Electric Rotary Pumps. Castings of Aluminum, Composition and "Hecla" Bronze Bearing Metals. Manufacturing of every description.

SERVICE

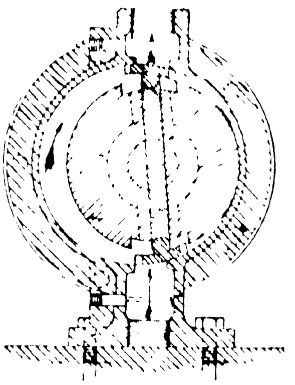
These pumps are admirably adapted for pumping large volumes of both light and heavy liquids against moderate heads. They are positive in their suction and discharge, self compensating as to wear, do not have to be primed and will "pick up" readily on high suction lifts.

They are being used at the present time for the pumping of water, chemicals, gasoline, benzine, turpentine, soap, tar, white lead, varnish, paint, thick mash, hot and cold beer, and many other fluids and semi-fluids.

All pumps are thoroughly tested before leaving the plant and are fully guaranteed to do the service for which they are intended.

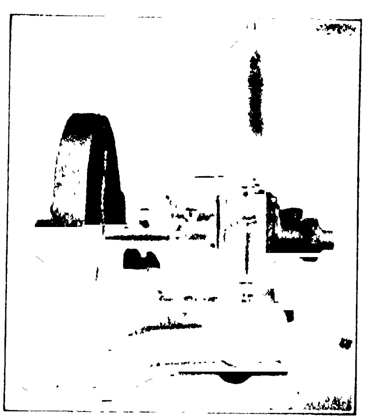
CONSTRUCTION

The illustration shows the interior construction of both the electric and belt driven types. The revolving piston sets close to the side of the cylinder and as same revolves a vacuum is formed behind the buckets as they sweep upward, causing the material being pumped to be drawn into the cylinder at the bottom and discharged at the top. This type is fitted with but two buckets and wearing shoes which are made of bronze, whether the case be of iron or bronze.


INTERIOR CONSTRUCTION

The wearing shoes which are inserted in the ends of the buckets oscillate with the bore of the cylinder, thereby greatly reducing the friction directed against the wall of the cylinder. The shoes are the only members which receive any great amount of wear and are therefore interchangeable. The buckets do not come in contact with the cylinder wall. Consequently, the only friction they receive, which is slight, is caused by their moving in and out in the piston slots. The journals are supported in interchangeable bearings which also serve as packing glands for the stuffing boxes. All bearings are lubricated by means of grease cups.

MOTOR DRIVEN TYPE


MOTOR DRIVEN PUMP

MOTOR DRIVEN PUMP

The pump together with motor is mounted upon a substantial cast iron bedplate and is driven by a single reduction cut gear and micarda motor pinion to eliminate unnecessary noise. The bedplate is capable of mounting A.C. or D.C. motors of most any manufacture. The suction is taken from the bedplate, thus eliminating disconnecting of suction pipe, should it be found necessary to dismantle the pump. The floor space required is small. This type is suitable for 50 75 pounds per square inch pressure. Furnished with or without by-pass and air chamber. See table below for sizes and capacities. Mention unit No. 1A.

BELT DRIVEN TYPE

BELT DRIVEN PUMP

Although the bedplate is considerably smaller this pump is constructed identically the same as the electric type shown above. It is fitted with tight and loose pulleys. Mention unit No. 1B.

QUOTATIONS

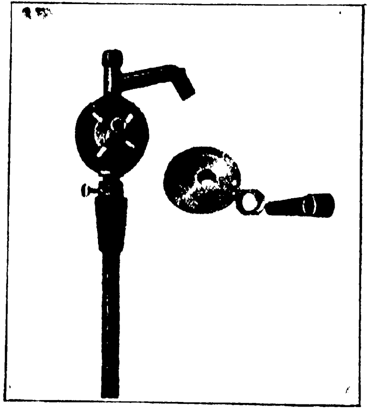
When quotations are requested on motor driven pumps kindly advise for what service the pump is to be used. Information should include voltage, whether A.C. or D.C. If A.C. phase and cycles.

SIZES AND CAPACITIES

Suction pipe size	Discharge pipe size	Revolutions per min	Displacement Gallons per min	Pulleys	
				Diam	Width
¾"	¾"	[illegible]	18	6"	1½"
1"	1"	210	[illegible]	8"	2½"
1½"	1½"	240	65	10"	2½"
2"	2"	210	[illegible]	14"	3"
3"	3"	200	125	16"	4"
4"	4"	200	245	[illegible]	6"

BARREL OR TRANSFER PUMP

These pumps are recommended for pumping both free flowing and viscous liquids from barrels, drums, tanks, vats, etc. They are positive of suction, do not require priming and have a displacement of one pint per each revolution. They are fitted with bronze buckets, 36 inch suction pipe, taper bung attachment, handle and gooseneck. Connections are one inch. Weighs 26 lbs. complete with all attachments. Mention unit No. 2A.


BARREL OR TRANSFER PUMP

HENRY E. JACOBY, M.E.

(Member A. S. M. E.)

Specialist in Chemical Machinery and Equipment

95-97 Liberty St.

NEW YORK CITY

PRODUCTS: Complete trains of equipment for the manufacture of chemicals of all kinds, comprising evaporators, dryers, filter presses, stills, kettles, tanks, mixers and grinders, pumps and all accessories.

SPECIALTIES:

No matter how unique or special your piece of apparatus may be, we undoubtedly have facilities in one of our shops to manufacture it.

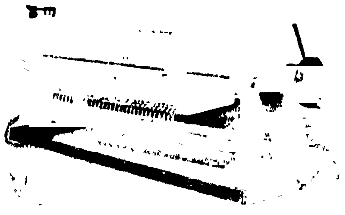
EVAPORATORS:

We are the Sole Representatives in New York City and surrounding territory of **Zaremba Company**, and in a position to furnish evaporating equipment of all sizes, and of the latest and most improved design.

DRYERS:

Almost fifteen years' experience in the manufacture and installation of dryers of various kinds, vacuum as well as non-vacuum, puts us in a position to be of particular service to you in the solving of your dryer problems.

FILTER PRESSES:



As Eastern Sales Representative of **D. R. Sperry & Company**, we are able to supply filter press equipment of the highest quality, superior to any on the market today.

STILLS AND KETTLES:

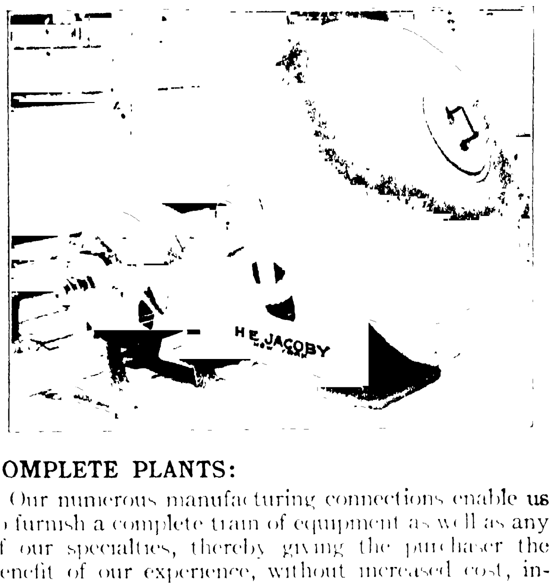
We build a large variety of apparatus of this type, in iron, steel, copper, lead and enamel-lined stills and kettles.

STILLS

The illustration shows one of the special stills, selected at random, which we have manufactured. We have designed and built special stills of iron, steel, copper, aluminum, lead and enamel lined metal.

DRY MIXERS AND GRINDERS

One of our specialties has been the manufacture of dry mixing and grinding mills of which we have supplied a large number to dye and color manufacturers. We manufacture these in sizes ranging from 18" diameter to 45" diameter drums.



COMPLETE PLANTS:

Our numerous manufacturing connections enable us to furnish a complete train of equipment as well as any of our specialties, thereby giving the purchaser the benefit of our experience, without increased cost, insuring a properly balanced plant, and relieving him of all the responsibility of proportioning his various pieces of apparatus.

Let us quote you on your plant on a one assignment basis.

JANOS ASBESTOS COMPANY

Manufacturers of Asbestos Products

26 Cortlandt Street

NEW YORK, N. Y.

Trade Mark

PRODUCTS

- Superheat Sheet Packing
- Asbestos Metallic Gaskets
- Motor Sheet Packing
- Asbestos Wick Packing
- Asbestos Gloves and Mittens, and other specialties.

SUPERHEAT SHEET PACKING

Guaranteed for all pressures of saturated and superheated steam, acid, alkali, ammonia, naphtha, gas, gasoline, oil, air, liquids and sugar solutions. It is made of Long Fiber Asbestos, formed into sheets under tremendous pressure with correct binding material. Size of standard sheet fifty inches square, 1/32" to 1/4" thick.

ASBESTOS METALLIC GASKETS

Made from the very best Asbestos Cloth, reenforced with fine brass wire to withstand the highest steam pressure and temperature. Furnished in all sizes and shapes.

MOTOR SHEET PACKING

Recommended for cylinder heads on Gas and Gasoline Engines and for universal use. Made in rolls thirty-nine inches wide, 1/32" and 1/16" thick.

ASBESTOS WICK PACKING

Is acid and fireproof and extensively used in chemical plants. It is composed of strands of the purest Asbestos Fiber and supplied in 1/2 and 1 pound balls, 1/4" thick. Tightly twisted rope furnished in 25 and 50 pound reels, 1/8" to 2" diam.

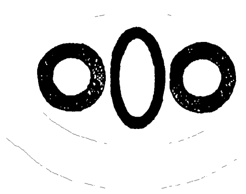
ASBESTOS GLOVES AND MITTENS

Made from heavy weight Asbestos Cloth for every industrial requirement. They are flexible, durable, heat and fluid-proof. We are prepared to make up Asbestos Leggings, Aprons, and other Asbestos Clothing for the protection to the person handling superheated articles, molten metals and corrosive acids.

OTHER SPECIALTIES

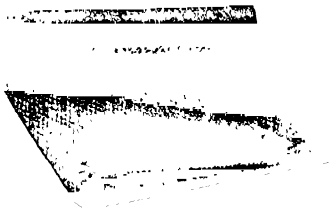
- Asbestos Blankets
- Asbestos Carded Fiber
- Asbestos Cloth, with or without wire insertion
- Asbestos Cord
- Asbestos Millboard in sheets 40 inches square
- Asbestos Paper in rolls thirty-six inches wide
- Asbestos Pipe Covering
- Asbestos Table Covers
- Asbestos Tape
- Asbestos Tubing
- Asbestos Yarn
- Asbestos Packing for high, medium and low pressure.
- Rubber Hose, Belting, Pump Valves
- Mechanical Rubber Goods.

JANOS SUPERHEAT SHEET PACKING NO. 300

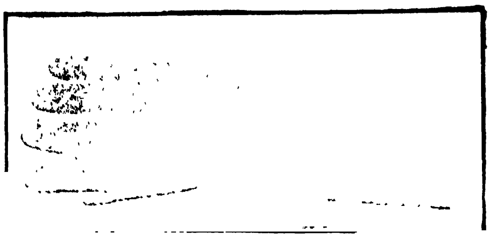


JANOS ASBESTOS METALLIC GASKETS

JANOS ASBESTOS WICK PACKING



JANOS MOTOR SHEET PACKING



JANOS ASBESTOS GLOVES

GUARANTEE OF QUALITY

Janos products are a standard of excellence.

The trade-mark "Janos" is a guarantee of quality. It is also an emblem of the good faith, the good will, the principles and the ideals of the manufacturers.

INFORMATION

We will gladly furnish any information regarding our products or give our customers the benefit of our large experience in this line in the way of advice or suggestions regarding the most suitable asbestos material to meet any condition.

FOR EVERY CHEMICAL INDUSTRY

JANTZ & LEIST ELECTRIC CO.

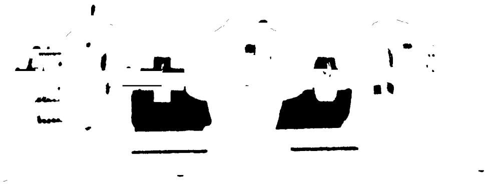
Manufacturers of

Electric Motors and Generators

WESTERN AVE., AND YORK ST., CINCINNATI, OHIO

PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.



MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

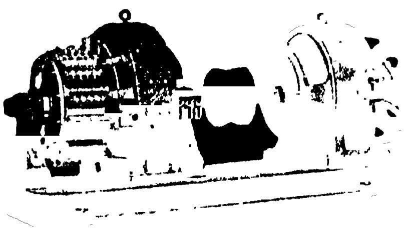
A C Set Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor Generators and motor mounted on substantial base rails, with exciter attached

D C Set Consists of two direct current low voltage generators and one direct current motor, motor either 115 230 or 550 volts Shunt rheostat for each generator and "no voltage" automatic release starter for the motor Generators and motors mounted on substantial iron base rails

Operation A C				Motor H P	Operation D C				Motor H P
Parallel		Series			Parallel		Series		
Amps	Volts	Amps	Volts		Amps	Volts	Amps	Volts	
2400	3-6	1200	6-12	35	2400	3-6	1200	6-12	28
3200	3-6	1600	6-12	50	3200	3-6	1600	6-12	40
4000	3-6	2000	6-12	50	4000	3-6	2000	6-12	50
5000	3-6	2500	6-12	60	5000	3-6	2500	6-12	60
7000	3-6	3500	6-12	100	7000	3-6	3500	6-12	85
8000	5-10	4000	10-20	150	8000	3-6	4000	6-12	100
10000	4-8	5000	8-16	150	10000	2-8	5000	4-16	150

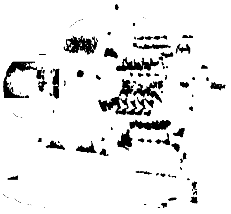
ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached With each generator we furnish a shunt rheostat, with the larger motors a compensator



DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator Motors standard voltages, either 110 to 125 or 220 to 250 volts Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor

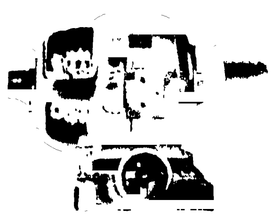


DIRECT CURRENT BELTED TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEOSTAT

Amperes	Volts	R P M
175	2-5	900
	3-7	1200
400	2-5	720
	4-8	1200
600	2-6	720
	4-8	900
800	2-6	720
	4-8	900
1200	2-6	600
	4-8	720
1600	2-6	550
	4-8	600
	5-10	720
	6-12	800
2000	2-6	550
	4-8	600
	5-10	720
	6-12	800
2500	3-6	175
	4-8	500
	5-10	600
	6-12	720
3500	3-6	125
	4-8	175
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	4-8	7½	1200	7½	1200
600	2-6	7½	720	7½	720
	4-8	10	900	10	900
800	2-6	10	720	10	720
	4-8	15	900	15	900
1200	2-6	15	600	15	600
	4-8	20	720	20	720
1600	2-6	20	600	20	600
	4-8	25	600	27	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	4-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	4-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	4-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	600
5000	3-8	75	450	75	450



115 230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty
From 1 H P to 100 H P

H P	R P M	Standard Pulley		
		Dia	Face	Bore
1	450	4	3	1 3/16
	240	5	4	1 5/16
2	875	4	4	1 3/16
	400	5	4	1 5/16
	240	5	4	1 5/16
	220	6	5	1 7/16
2.5	1000	5	3	1 3/16
	475	5	4	1 5/16
	475	5	4	1 5/16
	250	6	6	1 7/16
3	1350	5	3	1 3/16
	550	6	4	1 5/16
	430	6	4	1 5/16
	285	7	5	1 7/16
3.5	675	5	5	1 5/16
	500	5	5	1 5/16
4	375	8	5	1 7/16
5	1000	5	5	1 5/16
	750	6	5	1 5/16
	400	8	5	1 7/16
	300	9	6	1 7/16
7.5	1800	5	4	1 5/16
	1150	6	5	1 5/16
	650	8	6	1 7/16
	500	10	6	1 7/16
	425	10	6	1 7/16
10	1700	8	5	1 5/16
	1000	8	5	1 7/16
	750	8	6	1 7/16
	600	8	6	1 7/16
	400	10	8	1 15/16
15	1350	7	6	1 7/16
	1050	8	8	1 15/16
	850	10	6	1 15/16
	575	10	8	1 15/16
	490	12	8	1 15/16
20	800	10	8	1 15/16
	525	12	8	1 15/16
	325	16	10	2 3/16
30	1200	10	8	1 15/16
	1000	10	8	1 15/16
	750	12	8	2 3/16
35	850	12	10	2 3/16
	625	12	10	2 3/16
40	525	14	10	2 11/16
50	675	14	12	2 11/16
60	1000	14	12	2 11/16
	435	20	16	2 11/16
75	575	20	16	2 11/16
100	800	20	18	2 11/16

115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P to 15 H P

H. P	R. P. M	Efficiency		
		100%	75%	50%
5	1750	85	83	78.5
	1150	86	84.1	79.4
7½	1750	86.5	84.5	79.8
	1150	87	85	80
10	1750	87	85.2	80
	1150	87.2	85.3	80.5
15	1750	87.2	85.2	80.2
	1150	87.5	86	80.9
20	1750	88	86.1	80.6
	1150	88	86	81.3
25	1750	88.6	86.2	81.5
	1150	89	87.2	83
35	1750	89.3	87.8	83.3
	1150	89.7	88	84
40	1750	90	88.3	84.3
	1150	90.5	89.2	86.2
50	1750	91.	89.7	89
	1150	91	89.7	87
60	1750	91.2	90	87
	1150	91.3	90	87

THE JEFFREY MANUFACTURING COMPANY

MAIN OFFICE AND WORKS

921 NORTH FOURTH STREET, COLUMBUS, OHIO

BRANCH OFFICES

Buffalo 1104 Marine Trust Bldg
Boston 141 Milk Street
New York, 9010 Hudson Terminal Bldg
Chicago McCormick Bldg
Denver 1 1 U S National Bank Bldg
Dallas Commonwealth National Bank Bldg

Philadelphia Real Estate Trust Bldg
St Louis Railway Exchange Bldg
Scranton, 516 Union National Bank Bldg
Montreal Canada Power Bldg
Los Angeles, Herman W Hellman Bldg

Detroit Book Bldg
Pittsburgh, Farmers Bank B
Milwaukee, M & M Bldg
Birmingham, Brown Marx B
Cleveland Leader News Bld

PRODUCTS

Crushing, Pulverizing and Shredding Machinery; Elevating and Conveying Machinery for handling all kinds of materials, including Coal and Ashes Handling Equipments, Malleable Iron and Steel Chains; Portable Loaders and Unloaders; Power Transmission Machinery; Coal and Metal Mining Machinery, Mine and Industrial Locomotives, etc.

ENGINEERING SERVICE

As materials and processes vary to a considerable degree in every industry or chemical plant, equipment for the handling and treatment of materials should have special consideration.

Our experienced Engineers will be glad to submit recommendations and quotations upon our Standard Equipments or adaptations thereof, to suit the individual requirements of users.

JEFFREY SWING HAMMER PULVERIZERS

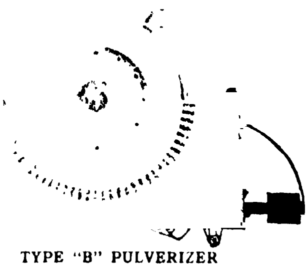
Especially adaptable for the reduction of Raw and Finished Materials in Chemical Plants, for Lime, Limestone, Coal, Coke, Chemicals, Fertilizer Materials, Pitch, Nitre Coke, and similar materials.

Built in many sizes and types adapted to the handling of a great variety of materials, with wide range of capacity and product.

TYPE "A" PULVERIZER

Write for Catalog No. 147-H.

The Swing Hammer Pulverizer is designed to reduce by striking material in suspension as opposed to the attrition mill which mashes or rolls. While primarily used for limestone, shale, etc., it is also well adapted to pulverizing coal for coking purposes.

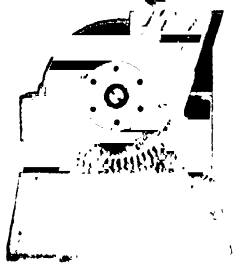


TYPE "B" PULVERIZER

JEFFREY TYPE "A" AND TYPE "E" SWING HAMMER SHREDDERS

Especially adapted for the preparation of Fibrou Materials such as Bark, Chips, Beans, Nuts, Seed etc., in Chemical and Extract Plants, Turpentine and Dye Works, Alcohol Plants, etc.

Catalogs Nos. 245-C and 259-A have valuable data including Plant Layouts, etc.



TYPE "A" SHREDDER

TYPE "E" BALL BEARING SHREDDER

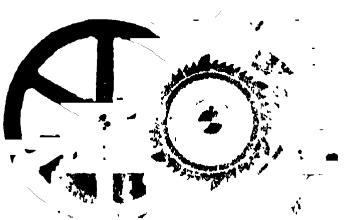
JEFFREY ROLL CRUSHERS

For the reduction of Coal and Coke these crushers are especially adapted to conditions requiring the handling of large capacities, reduction of large lumps, uniformity of product or other special results.

Write for Catalogs Nos. 141-Z and 248-C.

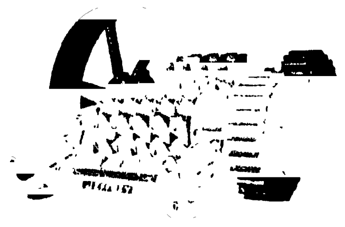
The Double Roll Crusher is used for break-down service of coal and similar materials, where the products are not required to be of quite the uniformity in sizes as obtained with the Single Roll Crusher.

Patented



SINGLE ROLL COAL CRUSHER

For sizing Coal for Stoker Use, for Preliminary to Drying and to Pulverizing Mills



DOUBLE ROLL CRUSHERS AND COKE SIZERS

For Coal, Coke and Chemicals

DATA, JEFFREY SINGLE ROLL COAL CRUSHERS

Table of Capacities			Using Hard Bituminous Coal Such as Indiana Block							Using Medium Bituminous Coal Such as Ohio or Illinois Run-of-Mine							Using Soft Bituminous Coal Such as Pocahontas						
			*Size of Product—Tons per Hr							*Size of Product—Tons per Hr							*Size of Product—Tons per Hr						
Size Crusher Inches	Drum R P M	Appr'x H P †	1"	1¼"	1½"	2"	2½"	3"	4"	1"	1¼"	1½"	2"	2½"	3"	4"	1"	1¼"	1½"	2"	2½"	3"	4"
18 x 18	75	15	15	20	25	30				20	25	30	35				40	40	50	50			
24 x 24	60	30	30	35	45	60	75	90		50	60	70	80	90	100		100	110	115	120	120	120	
30 x 30	50	40	50	50	60	80	100	120	160	75	85	100	125	150	170	180	160	170	180	190	200	200	200
36 x 36	40	60	75	80	110	120	130	150	175	115	120	150	85	210	250	300	175	200	250	275	275	300	350

*By "Size of Product" is meant average results, 80 to 90 per cent pass screen indicated

†Horse power will vary according to exact nature of coal as to hardness, toughness, friability and moisture.

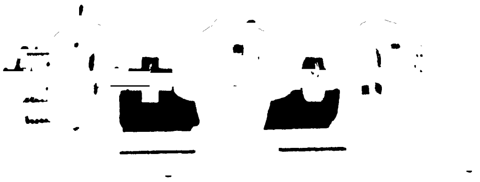
Continued on Next Page

JANTZ & LEIST ELECTRIC CO.

Manufacturers of
Electric Motors and Generators
WESTERN AVE., AND YORK ST., CINCINNATI, OHIO

PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.



MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

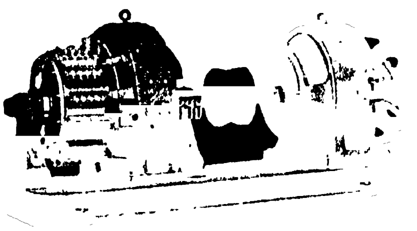
A C Set Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor Generators and motor mounted on substantial base rails, with exciter attached

D C Set Consists of two direct current low voltage generators and one direct current motor, motor either 115 230 or 550 volts Shunt rheostat for each generator and "no voltage" automatic release starter for the motor Generators and motors mounted on substantial iron base rails

Operation A C				Motor H P	Operation D C				Motor H P
Parallel		Series			Parallel		Series		
Amps	Volts	Amps	Volts		Amps	Volts	Amps	Volts	
2400	3-6	1200	6-12	35	2400	3-6	1200	6-12	28
3200	3-6	1600	6-12	50	3200	3-6	1600	6-12	40
4000	3-6	2000	6-12	50	4000	3-6	2000	6-12	50
5000	3-6	2500	6-12	60	5000	3-6	2500	6-12	60
7000	3-6	3500	6-12	100	7000	3-6	3500	6-12	85
8000	5-10	4000	10-20	150	8000	3-6	4000	6-12	100
10000	4-8	5000	8-16	150	10000	2-8	5000	4-16	150

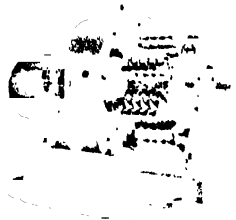
ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached With each generator we furnish a shunt rheostat, with the larger motors a compensator



DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator Motors standard voltages, either 110 to 125 or 220 to 250 volts Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor

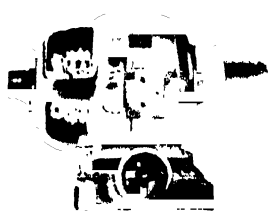


DIRECT CURRENT BELTED TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEOSTAT

Amperes	Volts	R P M
175	2-5	900
	3-7	1200
400	2-5	720
	4-8	1200
600	2-6	720
	4-8	900
800	2-6	720
	4-8	900
1200	2-6	600
	4-8	720
1600	2-6	550
	4-8	600
	5-10	720
	6-12	800
2000	2-6	550
	4-8	600
	5-10	720
	6-12	800
2500	3-6	175
	4-8	500
	5-10	600
	6-12	720
3500	3-6	125
	4-8	175
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

DATA MOTOR GENERATOR SETS

		A C Set		D C Set	
Amps	Volts	Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	4-8	7½	1200	7½	1200
600	2-6	7½	720	7½	720
	4-8	10	900	10	900
800	2-6	10	720	10	720
	4-8	15	900	15	900
1200	2-6	15	600	15	600
	4-8	20	720	20	720
1600	2-6	20	600	20	600
	4-8	25	600	27	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	4-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	4-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	4-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	600
5000	3-8	75	450	75	450



115 230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty
From 1 H P to 100 H P

		Standard Pulley		
H P	R P M	Dia	Face	Bore
1	450	4	3	1 3/16
	230	5	4	1 5/16
2	875	4	4	1 3/16
	400	5	4	1 5/16
	240	5	4	1 5/16
	220	6	5	1 7/16
2.5	1000	5	3	1 3/16
	475	5	4	1 5/16
	475	5	4	1 5/16
	250	6	6	1 7/16
3	1350	5	3	1 3/16
	550	6	4	1 5/16
	430	6	4	1 5/16
	285	7	5	1 7/16
3.5	625	5	5	1 5/16
	500	5	5	1 5/16
4	375	8	5	1 7/16
5	1000	5	5	1 5/16
	750	6	5	1 5/16
	400	8	5	1 7/16
	300	9	6	1 7/16
7.5	1800	5	4	1 5/16
	1150	6	5	1 5/16
	650	8	6	1 7/16
	500	10	6	1 7/16
	425	10	6	1 7/16
10	1700	8	5	1 5/16
	1000	8	5	1 7/16
	750	8	6	1 7/16
	600	8	6	1 7/16
	400	10	8	1 15/16
15	1350	7	6	1 7/16
	1050	8	8	1 15/16
	850	10	6	1 15/16
	575	10	8	1 15/16
	490	12	8	1 15/16
20	800	10	8	1 15/16
	525	12	8	1 15/16
	325	16	10	2 3/16
30	1200	10	8	1 15/16
	1000	10	8	1 15/16
	750	12	8	2 3/16
35	850	12	10	2 3/16
	625	12	10	2 3/16
40	525	14	10	2 13/16
50	675	14	12	2 13/16
60	1000	14	12	2 13/16
	435	20	16	2 13/16
75	575	20	16	2 13/16
100	800	20	18	2 13/16

115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P to 15 H P

		Efficiency		
H. P	R. P. M	100%	75%	50%
5	1750	85	83	78.5
	1150	86	84.1	79.4
7½	1750	86.5	84.5	79.8
	1150	87	85	80
10	1750	87	85.2	80
	1150	87.2	85.3	80.5
15	1750	87.2	85.2	80.2
	1150	87.5	86	80.9
20	1750	88	86.1	80.6
	1150	88	86	81.3
25	1750	88.6	86.2	81.5
	1150	89	87.2	83
35	1750	89.3	87.8	83.3
	1150	89.7	88	84
40	1750	90	88.3	84.3
	1150	90.5	89.2	86.2
50	1750	91.	89.7	89
	1150	91	89.7	87
60	1750	91.2	90	87
	1150	91.3	90	87

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Valves in Brass, All Iron, Iron Body and Cast Steel, for all pressures and purposes; Gauge Cocks, Steam Traps; Mechanical Rubber Goods, including Sheet Packing, Gaskets, Gasket Tubing, Valve Discs, Pump Valves, Union Rings and the like; Compressed Asbestos Jointing.

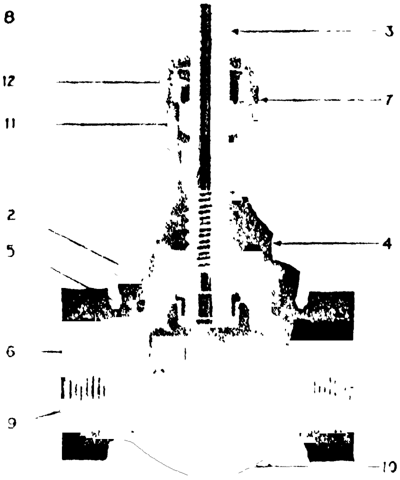
JENKINS VALVES, STANDARD PATTERN

Renewable disc type.

They represent a distinct type of valve as compared with regrinding, bevel or flat-seated valves. Instead of using a solid metal clapper, they contain a disc holder of brass or other suitable metal, and a removable disc of softer material, preferably Jenkins composition disc. This disc in service presents a slightly yielding surface to the valve seat and is flexible enough to adapt itself to any slight inequalities in the seat caused by grit or sediment carried into the pipes, insuring perfect contact. Should the disc be injured, it is only necessary to remove it and replace with a new one, which can be done easily and quickly.

The disc takes up the wear and gives the valve practically unlimited life.

Jenkins valves have full opening. They are made of a special high grade steam metal and contain, besides the Jenkins disc, metal glands or followers in stuffing box, and other valuable features.



SECTIONAL VIEW OF JENKINS BRASS GLOBE VALVE, STANDARD PATTERN, FIG. 106

Description of Parts

1	Wheel	6	Disc	10	Body
2	Lock Nut	7	Packing Nut	11	Stuffing Box Packing
3	Spindle	8	Wheel Nut	12	Gland or Follower
4	Bonnet	9	Disc Removing Nut		
5.	Disc Holder				

BRASS VALVES, STANDARD PATTERN

Globe, Angle and Cross Valves—Screwed or flanged, are regularly furnished with Jenkins No. 119 discs, suitable for 150 lbs. working steam pressure. When specified for cold water, valves are fitted with No. 93 discs, suitable for working water pressure up to 250 lbs. Regular sizes ⅛ to 3 ins. Larger sizes in brass made from special patterns.

Check Valves—Jenkins brass horizontal, angle and vertical check valves correspond to same standard as the standard pattern globe and angle valves. Regularly furnished with Jenkins disc of semihard composition which will soften slightly under the action of hot water as required for boiler feed lines. When specified for cold water, cold liquids, air or gas, a softer and more flexible rubber disc is supplied, usually Jenkins No. 93 composition. Suitable for 150 lbs working pressure. Sizes ⅛ to 3 ins., screwed or flanged.

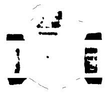


Fig. 117
HORIZONTAL

Fig. 118
ANGLE

Fig. 119
VERTICAL

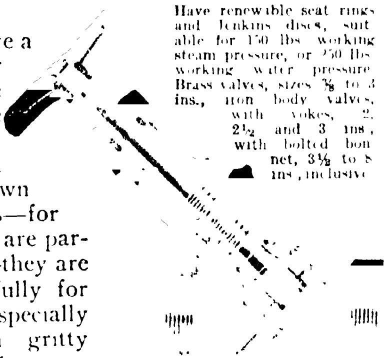
Fig. 352
SWING CHECK

BRASS SWING CHECK VALVES, STANDARD

Jenkins brass swing check valves, standard pattern, are made with globe shaped bodies, adapted for either horizontal or vertical installation; have renewable disc feature same as the horizontal pattern; and are suitable for same working pressures. Sizes ⅛ to 3 ins., screwed or flanged.

"Y" VALVES

These valves have a full opening nearly in line with the pipe, and offer little resistance to the free flow of steam or fluids. Best known as blow-off valves—for which service they are particularly adapted—they are also used successfully for other purposes, especially where thick and gritty fluids are handled, as in sugar refineries, pulp and paper mills, chemical and dye works.



Have renewable seat rings and Jenkins discs, suitable for 150 lbs working steam pressure, or 250 lbs working water pressure. Brass valves, sizes ⅜ to 3 ins., iron body valves, with yokes, 2, 2½ and 3 ins., with bolted bonnet, 3½ to 8 ins., inclusive.

BRASS "Y" VALVE
Standard Pattern

DIMENSIONS OF STANDARD PATTERN BRASS VALVES

Size, ins.	Fig.	*	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3
Globe, scr.	106	A	1 9/16	2⅛	2⅜	2¾	3 5/16	3 13/16	4¼	4⅞	5¾	6⅝	8½
Globe, flg	107	B		2 7/16	3	3 1/16	3⅝	4	4⅜	4⅞	6	6¾	7½
Angle, scr	108	C	11/16	1 1/16	1 3/16	1⅜	1½	1¾	2 1/16	2¼	2⅞	3¼	4¼
Angle, flg	109	D		1 13/16	2 1/16	2 1/16	2⅜	2⅝	2 13/16	3 3/16	3¾	4¼	4 9/16
Globe, scr. or flg	106–107	G	2⅝	3⅝	4⅛	4⅞	5¼	5¾	7	7¼	9⅛	9⅜	10⅛
Angle, scr or flg	108–109	G	2¾	3⅞	4	5	5⅝	6	7¼	7⅞	9¼	9¾	11¼
Horiz check, scr	117	A	1 9/16	2⅛	2⅜	2¾	3 5/16	3 13/16	4¼	4⅞	5¾	6⅝	8½
Horiz check, flg	120	B		2 7/16	3	3 1/16	3⅝	4	4⅜	4⅞	6	6¾	7½
Angle check, scr	118	C	11/16	1 1/16	1 3/16	1⅜	1½	1¾	2 1/16	2¼	2⅞	3¼	4¼
Angle check flg	120A	D	..	1 13/16	2 1/16	2 1/16	2⅜	2⅝	2 13/16	3 3/16	3¾	4¼	4 9/16
Horiz and angle	117 120A	GC	1⅛	1¼	1½	1¾	2	2¼	2½	2⅞	3½	3⅞	4¾
Vertical, scr	119	HC	1¾	2⅜	2 9/16	3 1/16	3 9/16	4⅛	4½	5¼	5 13/16	7⅜	9 1/16
Vertical, flg	120B	I	...	2⅞	3 1/16	3 7/16	3 13/16	4⅜	4 13/16	5½	6¼	7⅜	9 1/16
Y, scr	124	A	...	..	2⅜	3 1/16	3⅝	4¼	4¾	5¼	6⅝	7 13/16	9¾
Y, flg	125	B		.		4¼	4¾	5¼	6	6½	8⅛	9	11
Y, scr or flg	124–125	G	.	...	4	4⅞	5¼	6⅛	7⅜	8¼	9½	11⅝	14
Swing check, scr	352	A	..	..	2 7/16	2¾	3 3/16	3 13/16	4¼	4⅞	5¾	6⅝	7¾
Swing check, flg	353	B	...	..	3	3 1/16	3⅝	4	4⅜	4⅞	6	6¾	7½
Swing check, scr or flg	352 353	GC	..	...	1¾	2⅛	2 7/16	2¾	3	3½	4⅛	4⅝	5⅜

*A—Face to face, screwed
B—Face to face, flanged
C—Angle, center to face, screwed
D—Angle, center to face, flanged
G—Center to top of hand wheel, open.
GC—Center to top of cap
HC—Vertical, face to face, screwed.
I—Vertical, face to face, flanged

Continued on Next Page

JANTZ & LEIST ELECTRIC CO.

Manufacturers of

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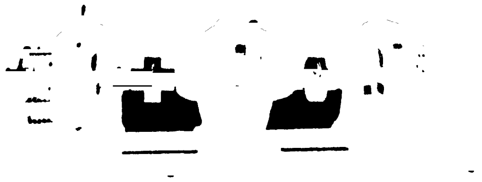
Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.

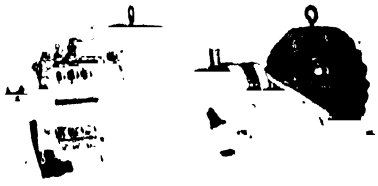


MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

A C Set- Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor Generators and motor mounted on substantial base rails, with exciter attached

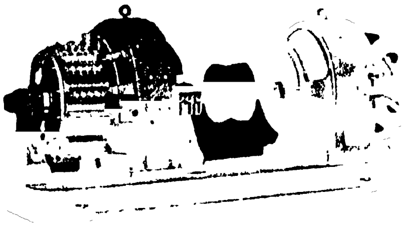
D C Set Consists of two direct current low voltage generators and one direct current motor, motor either 115 230 or 550 volts Shunt rheostat for each generator and "no voltage" automatic release starter for the motor Generators and motors mounted on substantial iron base rails

Operation A C				Motor H P	Operation D C				Motor H P
Parallel		Series			Parallel		Series		
Amps	Volts	Amps	Volts		Amps	Volts	Amps	Volts	
2400	3-6	1200	6-12	35	2400	3-6	1200	6-12	28
3200	3-6	1600	6-12	50	3200	3-6	1600	6-12	40
4000	3-6	2000	6-12	50	4000	3-6	2000	6-12	50
5000	3-6	2500	6-12	60	5000	3-6	2500	6-12	60
7000	3-6	3500	6-12	100	7000	3-6	3500	6-12	85
8000	5-10	4000	10-20	150	8000	3-6	4000	6-12	100
10000	4-8	5000	8-16	150	10000	2-8	5000	4-16	150



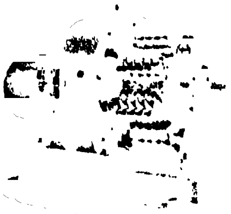
ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached With each generator we furnish a shunt rheostat, with the larger motors a compensator



DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator Motors standard voltages, either 110 to 125 or 220 to 250 volts Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor

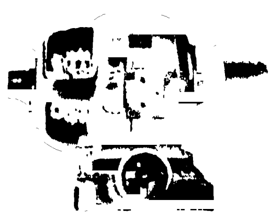


DIRECT CURRENT BELTED TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEOSTAT

Amperes	Volts	R P M
175	2-5	900
	3-7	1200
400	2-5	720
	4-8	1200
600	2-6	720
	4-8	900
800	2-6	720
	4-8	900
1200	2-6	600
	4-8	720
1600	2-6	550
	4-8	600
	5-10	720
	6-12	800
2000	2-6	550
	4-8	600
	5-10	720
	6-12	800
2500	3-6	175
	4-8	500
	5-10	600
	6-12	720
3500	3-6	125
	4-8	175
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	4-8	7½	1200	7½	1200
600	2-6	7½	720	7½	720
	4-8	10	900	10	900
800	2-6	10	720	10	720
	4-8	15	900	15	900
1200	2-6	15	600	15	600
	4-8	20	720	20	720
1600	2-6	20	600	20	600
	4-8	25	600	27	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	4-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	4-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	4-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	500
5000	3-8	75	450	75	450



115 230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty
From 1 H P to 100 H P

H P	R P M	Standard Pulley		
		Dia	Face	Bore
1	450	4	3	1 3/16
	230	5	4	1 5/16
2	875	4	4	1 3/16
	400	5	4	1 5/16
	240	5	4	1 5/16
	220	6	5	1 7/16
2.5	1000	5	3	1 3/16
	475	5	4	1 5/16
	375	5	4	1 5/16
	250	6	6	1 7/16
3	1350	5	3	1 3/16
	550	6	4	1 5/16
	430	6	4	1 5/16
	285	7	5	1 7/16
3.5	625	5	5	1 5/16
	500	5	5	1 5/16
4	375	8	5	1 7/16
5	1000	5	5	1 5/16
	750	6	5	1 5/16
	400	8	5	1 7/16
	300	9	6	1 7/16
7.5	1800	5	4	1 5/16
	1150	6	5	1 5/16
	650	8	6	1 7/16
	500	10	6	1 7/16
	425	10	6	1 7/16
10	1700	8	5	1 5/16
	1000	8	5	1 7/16
	750	8	6	1 7/16
	600	8	6	1 7/16
	400	10	8	1 15/16
15	1350	7	6	1 7/16
	1050	8	8	1 15/16
	850	10	6	1 15/16
	575	10	8	1 15/16
	490	12	8	1 15/16
20	800	10	8	1 15/16
	525	12	8	1 15/16
	325	16	10	2 3/16
30	1200	10	8	1 15/16
	1000	10	8	1 15/16
	750	12	8	2 3/16
35	850	12	10	2 3/16
	625	12	10	2 3/16
40	525	14	10	2 13/16
50	675	14	12	2 13/16
60	1000	14	12	2 13/16
	435	20	16	2 13/16
75	575	20	16	2 13/16
100	800	20	18	2 13/16

115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P to 15 H P

H. P	R. P. M	Efficiency		
		100%	75%	50%
5	1750	85	83	78.5
	1150	86	84.1	79.4
7½	1750	86.5	84.5	79.8
	1150	87	85	80
10	1750	87	85.2	80
	1150	87.2	85.3	80.5
15	1750	87.2	85.2	80.2
	1150	87.5	86	80.9
20	1750	88	86.4	80.6
	1150	88	86	81.3
25	1750	88.6	86.2	81.5
	1150	89	87.2	83
35	1750	89.3	87.8	83.3
	1150	89.7	88	84
40	1750	90	88.3	84.3
	1150	90.5	89.2	86.2
50	1750	91.	89.7	89
	1150	91	89.7	87
60	1750	91.2	90	87
	1150	91.3	90	87

Fig 162a
Globe screwed

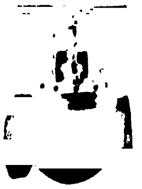


Fig 162
Globe flanged

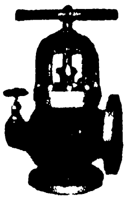


Fig 163
Angle flanged

IRON BODY GLOBE AND ANGLE VALVES, EXTRA HEAVY PATTERN

DIMENSIONS IRON BODY GLOBE ANGLE, CHECK AND Y VALVES, EXTRA HEAVY PATTERN

Size, ins	Fig	*	2	2½	3	3½	4	4½
Globe, scr	162A	A	7¾	9	11¼	11½	12¾	14
Globe, flg	162	B	9	10	10½	12½	12¾	14½
Angle, scr	163	C	3⅝	4½	5⅜	5⅝	6⅜	7
Angle, flg	163	D	4½	5	5⅜	6¼	6⅝	7¼
Globe, scr or flg	162A, 162	G	12⅞	14½	15¾	16¾	17⅞	18⅝
Angle, scr or flg	163A, 163	G	14	15	16	17⅝	18¾	19⅛
Horiz check, scr	265	A	7¾	9	10¼	11½	12¾	14
Horiz check, flg	266	B	9	10	11¾	12½	13¾	14½
Angle check, scr	267	C	3⅝	4½	5⅜	5¾	6⅜	7
Angle check, flg	268	D	4½	5	5⅝	6¼	6⅝	7¼
Horiz and angle	265–268	GC	4¼	4¾	5¼	5⅝	6	6⅝
Swing check, scr	338	A	7¾	9	10¼	11½	12¾	
Swing check, flg	339	B	9	10	11¾	12½	13¾	
Swing check, scr or flg	338, 339	GC	4¼	4¾	5¼	5⅝	6	.....
Y or blow off, scr	336	A	9	10 1/16	12			
Y or blow off, flg	337	B	10¾	12½	14			
Y or blow off, scr or flg	336, 337	G	14¾	16½	18½			

Size, ins (Continued)	Fig	*	5	6	7	8	9	10	12
Globe, scr	162A	A	15	17	18	19½	21	23	26
Globe, flg	162	B	15½	17	18½	20	21¼	23	26
Angle, scr	163	C	7½	8½	9	9¾	10½	11½	13
Angle, flg	163	D	7¾	8½	9¼	10	10⅝	11½	13
Globe, scr or flg	162A, 162	G	19¾	22⅛	23⅞	25	26½	28¾	32
Angle, scr or flg	163A, 163	G	20¾	23⅛	24¼	25½	27	29¼	32½
Horiz check, scr	265	A	15	17	18	19½		23	26
Horiz check, flg	266	B	15½	17	18½	20		23	26
Angle check, scr	267	C	7½	8½	9	9¾		11½	13
Angle check, flg	268	D	7¾	8½	9¼	10		11½	13
Horiz and angle	265–268	GC	6¾	7¾	8½	9¼		10¾	12¼
Swing check, scr	338	A	15	17	18	19½			
Swing check, flg	339	B	15½	17	18½	20	.	.	
Swing check, scr or flg	338, 339	GC	6¾	7⅝	8⅝	9⅛		.	.

*A Face to face, screwed D Angle, center to face, flanged
B Face to face, flanged G Center to top of hand wheel, open
C Angle center to face, screwed GC Center to top of cap

CAST STEEL VALVES

To meet the requirements of high pressure superheated steam and hydraulic service, Jenkins Bros manufacture a line of cast steel valves The globe, angle and cross valves have bodies and bonnets of cast steel, and the spindles, seat rings, discs and disc rings are of monel metal. All connecting flanges are made with 1/16 in. raised faces inside of bolt holes When ordered with flanges faced and drilled, the bolt holes will always be spot faced unless otherwise specified Globe, angle, cross and swing check valves in sizes 2 to 12 ins., inclusive, suitable for working steam pressure up to 350 lbs, and total temperature of 800° F.*

* See also Cast Steel Gate Valves

JENKINS GATE VALVES*

Standard Pattern—Brass, sizes ¼ to 3 ins. Iron body, sizes 2 to 30 ins. For working pressures 125 lbs. steam, 175 lbs water. All-iron—sizes ¼ to 30 ins.

Medium Pressure Pattern—Brass, sizes ¼ to 3 ins. Iron body, sizes 2 to 18 ins. For working pressures 175 lbs. steam, 250 lbs. water.

Extra Heavy Pattern—Brass, sizes ½ to 3 ins. Iron body, sizes 1½ to 24 ins For working pressures 250 lbs. steam, 400 lbs. water.

Extra Heavy Pattern—Cast steel, sizes 1½ to 24 ins. For working pressures 350 lbs. steam, and total temperature of 800° Fahr.

All Jenkins gate valves are of the solid wedge, double face type. The bodies are globe shaped, of great strength, and good proportions. All patterns are made with inside screw, stationary spindle, or outside screw and yoke, rising spindle. The latter are particularly recommended for the higher pressures, as the spin is more easily lubricated, increasing its durabil The traveling spindle also serves to indicate wheth the valve is open or closed. All the valves can b repacked under pressure when wide open, and all par are renewable and interchangeable. The iron bo and cast steel valves in the larger sizes are made w or without by-pass.

Valves can also be furnished with hub ends an square head stem, spur, bevel or special gearing, flo stands or indicator posts, and various other operatin mechanisms.

* See also All Iron Valves.

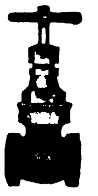


Fig 370

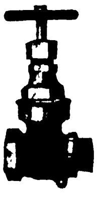


Fig 372

Standard pattern

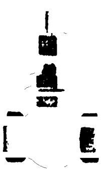


Fig 280

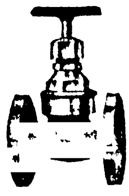


Fig 281

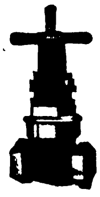


Fig 282

Extra heavy pattern

BRASS GATE VALVES

Standard Pattern

Size, Ins	Fig	*	¼	⅜	½	¾	1	1¼	1½	2	2½	3
I. S., scr	370	A	1¾	1¾	1 13/16	2 1/16	2 3/16	3	3⅜	4	4 11/16	5⅞
I. S., flg	371	B	2½	2⅝	2 13/16	3⅜	3 13/16	4½	4⅞	5¾	6½	7⅝
I. S., scr or flg	370, 371	G	3½	3½	3 13/16	4 13/16	5 7/16	6¼	6¾	7¾	9	10⅝
O. S. and Y	368	G				4¾	5½	6⅝	7¼	8¼	9 13/16	11½
O. S. and Y	368	H				5 13/16	6⅞	8 1/16	9 1/16	10⅝	12 13/16	15

Medium Pattern

Size, Ins	Fig	*	¼	⅜	½	¾	1	1¼	1½	2	2½	3
I. S., scr	270	A	2 5/16	2 5/16	2½	2⅞	3½	3 13/16	4 3/32	5 1/16	5¾	7
I. S., flg	271	B	3⅛	3¼	3¼	3 13/16	4¼	4¾	5 5/16	6	6 11/16	8½
I. S., scr or flg	270, 271	G	3⅞	3⅞	4⅝	5¼	6	6⅝	7	8¼	10¼	11½
O. S. and Y	275	G				5¼	6	7	7⅝	8⅝	10½	12¼
O. S. and Y	276	H				6⅝	7⅝	8½	9½	11⅛	13½	15¾

Extra Heavy Pattern

Size, Ins	Fig	*	¼	⅜	½	¾	1	1¼	1½	2	2½	3
I. S., scr	280	A			2 13/16	3 1/16	3¾	4¼	4¾	5⅞	6¾	7⅞
I. S., flg	281	B			3 13/16	4 7/16	5	5½	6	7⅛	8⅛	9
I. S., scr or flg	280, 281	G			4¾	5¾	6½	7¼	8	9¼	11	12⅛
O. S. and Y	282	G				5⅝	6 7/16	7¼	8	9⅝	10⅝	12 3/16
O. S. and Y .	283	H				6¾	7 13/16	9	10	12⅛	13¾	15⅞

*A Face to face, screwed G Center to top of hand wheel, open
B Face to face, flanged H Center to top of spindle, rising spindle open

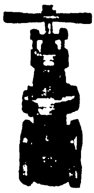


Fig 325
Inside screw

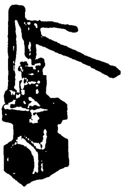


Fig 334
Quick opening sliding stem and lever

Fig 327
Hub ends

Fig 331
With yoke

Fig 346
With spur gear

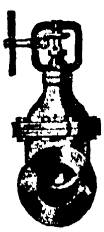


Fig 348
With bevel gear

IRON BODY GATE VALVES
STANDARD PATTERN

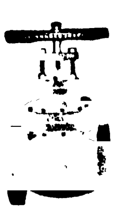


Fig 203
Inside screw, stationary spindle

Fig 204
O S and Y rising spindle without by-pass

Fig. 204b
O. S. and Y. rising spindle with by-pass

IRON BODY GATE VALVES, EXTRA HEAVY

Continued on Next Page

JANTZ & LEIST ELECTRIC CO.

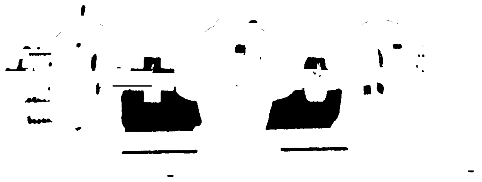
Manufacturers of

Electric Motors and Generators

WESTERN AVE., AND YORK ST., CINCINNATI, OHIO

PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.



MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

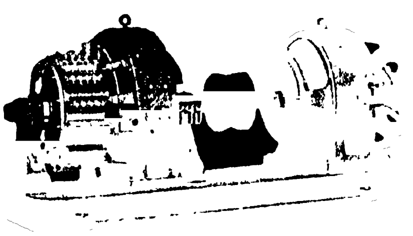
A C Set Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor Generators and motor mounted on substantial base rails, with exciter attached

D C Set Consists of two direct current low voltage generators and one direct current motor, motor either 115 230 or 550 volts Shunt rheostat for each generator and "no voltage" automatic release starter for the motor Generators and motors mounted on substantial iron base rails

Operation A C				Motor H P	Operation D C				Motor H P
Parallel		Series			Parallel		Series		
Amps	Volts	Amps	Volts		Amps	Volts	Amps	Volts	
2400	3-6	1200	6-12	35	2400	3-6	1200	6-12	28
3200	3-6	1600	6-12	50	3200	3-6	1600	6-12	40
4000	3-6	2000	6-12	50	4000	3-6	2000	6-12	50
5000	3-6	2500	6-12	60	5000	3-6	2500	6-12	60
7000	3-6	3500	6-12	100	7000	3-6	3500	6-12	85
8000	5-10	4000	10-20	150	8000	3-6	4000	6-12	100
10000	4-8	5000	8-16	150	10000	2-8	5000	4-16	150

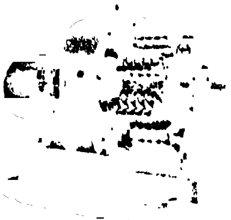
ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached With each generator we furnish a shunt rheostat, with the larger motors a compensator



DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator Motors standard voltages, either 110 to 125 or 220 to 250 volts Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor

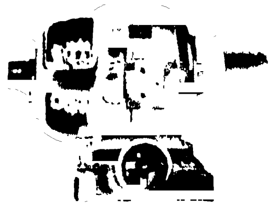


DIRECT CURRENT BELTED TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEOSTAT

Amperes	Volts	R P M
175	2-5	900
	3-7	1200
400	2-5	720
	4-8	1200
600	2-6	720
	4-8	900
800	2-6	720
	4-8	900
1200	2-6	600
	4-8	720
1600	2-6	550
	4-8	600
	5-10	720
	6-12	800
2000	2-6	550
	4-8	600
	5-10	720
	6-12	800
2500	3-6	175
	4-8	500
	5-10	600
	6-12	720
3500	3-6	125
	4-8	175
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	4-8	7½	1200	7½	1200
600	2-6	7½	720	7½	720
	4-8	10	900	10	900
800	2-6	10	720	10	720
	4-8	15	900	15	900
1200	2-6	15	600	15	600
	4-8	20	720	20	720
1600	2-6	20	600	20	600
	4-8	25	600	27	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	4-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	4-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	4-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	600
5000	3-8	75	450	75	450



115 230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty
From 1 H P to 100 H P

H P	R P M	Standard Pulley		
		Dia	Face	Bore
1	450	4	3	1 3/16
	230	5	4	1 5/16
2	875	4	4	1 3/16
	400	5	4	1 5/16
	240	5	4	1 5/16
	220	6	5	1 7/16
2.5	1000	5	3	1 3/16
	475	5	4	1 5/16
	375	5	4	1 5/16
	250	6	6	1 7/16
3	1350	5	3	1 3/16
	550	6	4	1 5/16
	430	6	4	1 5/16
	285	7	5	1 7/16
3.5	625	5	5	1 5/16
	500	5	5	1 5/16
4	375	8	5	1 7/16
5	1000	5	5	1 5/16
	750	6	5	1 5/16
	400	8	5	1 7/16
	300	9	6	1 7/16
7.5	1800	5	4	1 5/16
	1150	6	5	1 5/16
	650	8	6	1 7/16
	500	10	6	1 7/16
	425	10	6	1 7/16
10	1700	8	5	1 5/16
	1000	8	5	1 7/16
	750	8	6	1 7/16
	600	8	6	1 7/16
	400	10	8	1 15/16
15	1350	7	6	1 7/16
	1050	8	8	1 15/16
	850	10	6	1 15/16
	575	10	8	1 15/16
	490	12	8	1 15/16
20	800	10	8	1 15/16
	525	12	8	1 15/16
	325	16	10	2 3/16
30	1200	10	8	1 15/16
	1000	10	8	1 15/16
	750	12	8	2 3/16
35	850	12	10	2 3/16
	625	12	10	2 3/16
40	525	14	10	2 13/16
50	675	14	12	2 13/16
60	1000	14	12	2 13/16
	435	20	16	2 13/16
75	575	20	16	2 13/16
100	800	20	18	2 13/16

115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P to 15 H P

H. P	R. P. M	Efficiency		
		100%	75%	50%
5	1750	85	83	78.5
	1150	86	84.1	79.4
7½	1750	86.5	84.5	79.8
	1150	87	85	80
10	1750	87	85.2	80
	1150	87.2	85.3	80.5
15	1750	87.2	85.2	80.2
	1150	87.5	86	80.9
20	1750	88	86.1	80.6
	1150	88	86	81.3
25	1750	88.6	86.2	81.5
	1150	89	87.2	83
35	1750	89.3	87.8	83.3
	1150	89.7	88	84
40	1750	90	88.3	84.3
	1150	90.5	89.2	86.2
50	1750	91.	89.7	89
	1150	91	89.7	87
60	1750	91.2	90	87
	1150	91.3	90	87

JEWELL POLAR COMPANY

Polarstil

565-H West Van Buren Street
CHICAGO, ILL.

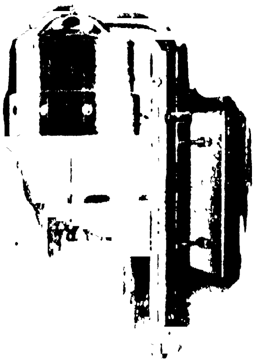
PRODUCTS

Apparatus for distilling, filtering, sterilizing, aerating, softening and storing water.

USES

To provide chemically pure, sterile, palatable and soft water for chemical, pharmaceutical, surgical, drinking and commercial purposes.

GAS LABORATORY STILL
Sizes 1, 2 and 3 gallons per hour



WALL TYPE LABORATORY STILL
Gas operated sizes ½, 1 1½ and 2 gallons per hour

DESCRIPTIVE

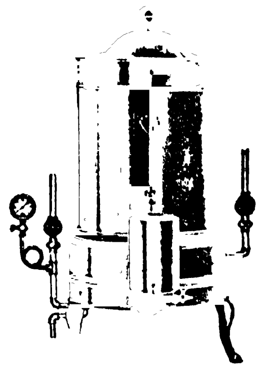
Polarstils offer a simple, permanent and economical means for providing distilled water for any particular purpose.

The valuable, exclusive features of these stills, which are recognized by Chemists and Engineers, are the result of over 40 years of practical experience in all branches of water purification.

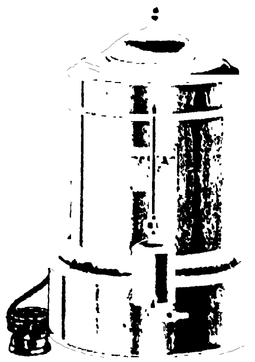
A list of users of Jewell Polar Products is a roster of many of the world's best known industrial and other institutions.

INDUSTRIAL WATER DISTILLING PLANTS

Steam operated, sizes 15 to 1000 gallons per hour. Larger plants designed and built on order. Compact, automatic and dependable installations with or without storage tanks



STEAM LABORATORY STILL
Sizes 2, 5 and 10 gallons per hour



ELECTRIC LABORATORY STILL
Sizes 1, 2 and 3 gallons per hour

MATERIAL

All **Polarstils** are made of heavy cold rolled copper and brass with pure block tin interiors.

GUARANTEES

Material, workmanship, purity of distillate and performance fully guaranteed.

SOME NOTABLE FEATURES

Automatic removal of gases and odors before raw water enters evaporator.

No condensing tubes to get limed up or leaky.

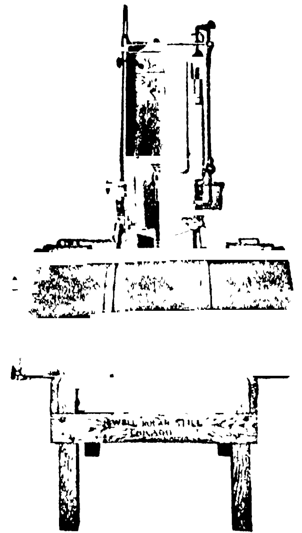
All parts easily accessible and interchangeable. Steam coil easily removed for cleaning.

Large plants may be operated single or double effect. Conform to any building or piping arrangements.

SOME USERS

General Motors Corp, Saginaw, Mich
Penn Salt Mfg Co, Wyandotte, Mich
Battle Creek Sanitarium, Battle Creek, Mich.
Allegheny Steel Co, Brackenridge, Pa
Butterworth-Judson Corp, New York, N Y
Becker Steel Co of America, Charleston, W Va.
Bethlehem Steel Co, Sparrow's Point, Md
French Lick Springs Hotel, French Lick, Ind
Western States Portland Cement Co, Independence, Kan
Scullin Steel Co, St Louis, Mo
Canadian Consolidated Rubber Co, Inc, Port Dalhousie, Ont
Mallinckrodt Chemical Works, St Louis, Mo
Roessler & Hasslacher Chemical Co, Perth Amboy, N J.
Standard Gauge Steel Co, Beaver Falls, Pa
The Newport Company, Carrollville, Wis
Kellogg Products, Inc, Buffalo, N Y.

are among those who have adopted the **Polarstil.**



STEAM OPERATED STILLS
Capacities, 15 to 1000 gallons per hour

Over 400 vessels are equipped with **Polarstils.**

They may be installed in connection with any circulating or refrigerating apparatus.

LITERATURE

We publish descriptive literature of our products, which we will gladly send on request.

JANTZ & LEIST ELECTRIC CO.

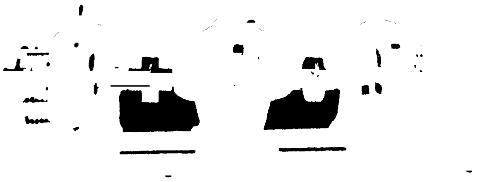
Manufacturers of

Electric Motors and Generators

WESTERN AVE., AND YORK ST., CINCINNATI, OHIO

PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.



MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

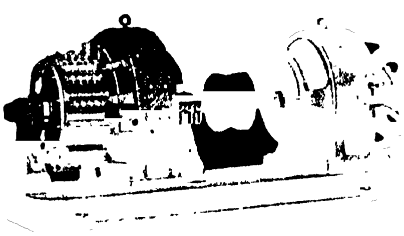
A C Set—Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor. Generators and motor mounted on substantial base rails, with exciter attached.

D C Set—Consists of two direct current low voltage generators and one direct current motor, motor either 115, 230 or 550 volts. Shunt rheostat for each generator and "no voltage" automatic release starter for the motor. Generators and motors mounted on substantial iron base rails.

Operation A C Parallel Amps	Volts	Operation A C Series Amps	Volts	Motor H P	Operation D C Parallel Amps	Volts	Operation D C Series Amps	Volts	Motor H P
2400	3-6	1200	6-12	35	2400	3-6	1200	6-12	28
3200	3-6	1600	6-12	50	3200	3-6	1600	6-12	40
4000	3-6	2000	6-12	50	4000	3-6	2000	6-12	50
5000	3-6	2500	6-12	60	5000	3-6	2500	6-12	60
7000	3-6	3500	6-12	100	7000	3-6	3500	6-12	85
8000	5-10	4000	10-20	150	8000	3-6	4000	6-12	100
10000	4-8	5000	8-16	150	10000	2-8	5000	4-16	150

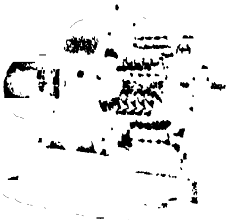
ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached. With each generator we furnish a shunt rheostat, with the larger motors a compensator.



DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator. Motors standard voltages, either 110 to 125 or 220 to 250 volts. Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor.

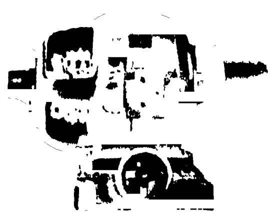


DIRECT CURRENT BELTED TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEOSTAT

Amperes	Volts	R P M
175	2-5	900
	3-7	1200
400	2-5	720
	4-8	1200
600	2-6	720
	4-8	900
800	2-6	720
	4-8	900
1200	2-6	600
	4-8	720
1600	2-6	550
	4-8	600
	5-10	720
	6-12	800
2000	2-6	550
	4-8	600
	5-10	720
	6-12	800
2500	3-6	475
	4-8	500
	5-10	600
	6-12	720
3500	3-6	425
	4-8	475
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set Motor H P	A C Set R P M	D C Set Motor H P	D C Set R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	4-8	7½	1200	7½	1200
600	2-6	7½	720	7½	720
	4-8	10	900	10	900
800	2-6	10	720	10	720
	4-8	15	900	15	900
1200	2-6	15	600	15	600
	4-8	20	720	20	720
1600	2-6	20	600	20	600
	4-8	25	600	27	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	4-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	4-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	4-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	500
5000	3-8	75	450	75	450



115 230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty
From 1 H P to 100 H P

H P	R P M	Standard Pulley Dia	Face	Bore
1	450	4	3	$1\frac{3}{16}$
	230	5	4	$1\frac{5}{16}$
2	875	4	4	$1\frac{3}{16}$
	400	5	4	$1\frac{5}{16}$
	240	5	4	$1\frac{5}{16}$
	220	6	5	$1\frac{7}{16}$
2.5	1000	5	3	$1\frac{3}{16}$
	475	5	4	$1\frac{5}{16}$
	375	5	4	$1\frac{5}{16}$
	250	6	6	$1\frac{7}{16}$
3	1350	5	3	$1\frac{3}{16}$
	550	6	4	$1\frac{5}{16}$
	430	6	4	$1\frac{5}{16}$
	285	7	5	$1\frac{7}{16}$
3.5	625	5	5	$1\frac{5}{16}$
	500	5	5	$1\frac{5}{16}$
4	375	8	5	$1\frac{7}{16}$
5	1000	5	5	$1\frac{5}{16}$
	750	6	5	$1\frac{5}{16}$
	400	8	5	$1\frac{7}{16}$
	300	9	6	$1\frac{7}{16}$
7.5	1800	5	4	$1\frac{5}{16}$
	1150	6	5	$1\frac{5}{16}$
	650	8	6	$1\frac{7}{16}$
	500	10	6	$1\frac{7}{16}$
	425	10	6	$1\frac{7}{16}$
10	1700	8	5	$1\frac{5}{16}$
	1000	8	5	$1\frac{7}{16}$
	750	8	6	$1\frac{7}{16}$
	600	8	6	$1\frac{7}{16}$
	400	10	8	$1\frac{15}{16}$
15	1350	7	6	$1\frac{7}{16}$
	1050	8	8	$1\frac{15}{16}$
	850	10	6	$1\frac{15}{16}$
	575	10	8	$1\frac{15}{16}$
	490	12	8	$1\frac{15}{16}$
20	800	10	8	$1\frac{15}{16}$
	525	12	8	$1\frac{15}{16}$
	325	16	10	$2\frac{3}{16}$
30	1200	10	8	$1\frac{15}{16}$
	1000	10	8	$1\frac{15}{16}$
	750	12	8	$2\frac{3}{16}$
35	850	12	10	$2\frac{3}{16}$
	625	12	10	$2\frac{3}{16}$
40	525	14	10	$2\frac{13}{16}$
50	675	14	12	$2\frac{13}{16}$
60	1000	14	12	$2\frac{13}{16}$
	435	20	16	$2\frac{13}{16}$
75	575	20	16	$2\frac{13}{16}$
100	800	20	18	$2\frac{13}{16}$

115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley. From 5 H P to 15 H P

H. P	R. P. M	Efficiency 100%	75%	50%
5	1750	85	83	78.5
	1150	86	84.1	79.4
7½	1750	86.5	84.5	79.8
	1150	87	85	80
10	1750	87	85.2	80
	1150	87.2	85.3	80.5
15	1750	87.2	85.2	80.2
	1150	87.5	86	80.9
20	1750	88	86.1	80.6
	1150	88	86	81.3
25	1750	88.6	86.2	81.5
	1150	89	87.2	83
35	1750	89.3	87.8	83.3
	1150	89.7	88	84
40	1750	90	88.3	84.3
	1150	90.5	89.2	86.2
50	1750	91	89.7	89
	1150	91	89.7	87
60	1750	91.2	90	87
	1150	91.3	90	87

W. A. JONES FOUNDRY & MACHINE CO.

Speed Reducers and General Power Transmission Machinery

1103 WEST ROOSEVELT ROAD, CHICAGO, ILL.

BRANCH OFFICE AND WAREHOUSE 20 MURRAY STREET, NEW YORK, N Y

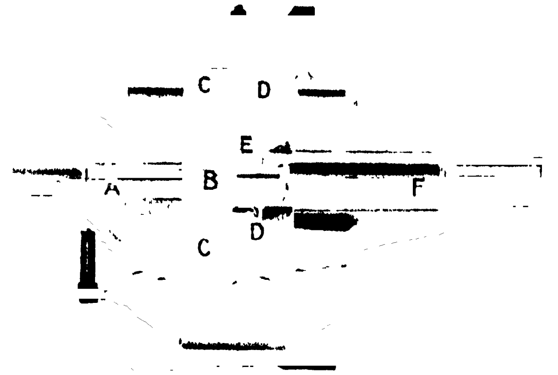
PRODUCTS

Spur and Worm Gear Speed Reducers; Cut Gears of Cast Iron, Cast Steel, Forged Steel and Bronze; Noiseless Pinions; Elevators and Conveyors; Cast Gears and Sprocket Wheels; Cast Iron Pulleys, Solid and Split; Ball Bearing Loose Pulleys; Friction Clutch Pulleys; Hangers; Pillow Blocks; Couplings, Rigid and Flexible; Safety Set Collars, Solid and Split.

Also Rope Sheaves, Ball Bearings, Roller Bearings, and other General Power Transmitting Machinery.

SPUR GEAR SPEED REDUCERS

Jones spur gear reducers are designed for use between electric motors and driven machines or shafts. They are a great improvement on belts, open gears and other cumbersome methods, and are now being used very generally in many industries.



SECTIONAL VIEW, JONES SPUR GEAR SPEED REDUCER, SINGLE TYPE

A singularly compact installation has been made possible by placing the drive and driven shafts on the same center line, and mounting three countershafts around them, evenly spaced and at equal distances from the drive and driven shafts. The housing is shown in section, so that only the upper of the three countershafts is visible. The pinion B, mounted on the high speed shaft A, meshes with and drives the three gears C, which are integral with the three pinions D. These mesh with and drive the gear E, which is mounted on the slow speed shaft F Just plain spur gear drives, with no internal gears or overhung shafts.

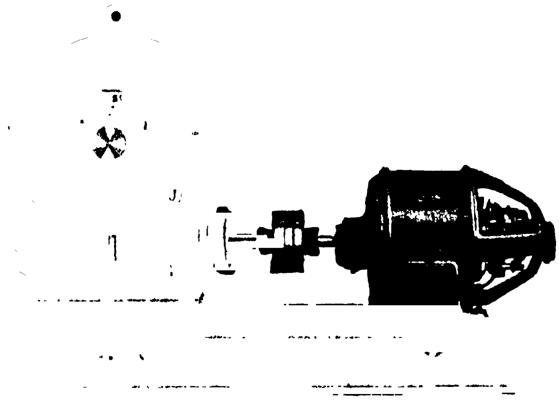
The adaptability of the Jones reducer is increased by the dustproof, oil-tight housing, which completely encloses the entire mechanism This complies with all safety laws. Special analysis steel in all gears makes for long life.

JONES SPUR GEAR SPEED REDUCER AND MOTOR MOUNTED ON CAST IRON BASE

WORM GEAR SPEED REDUCERS

Jones worm gear speed reducers are either furnished with standard shaft projections for connecting to motors and driven units, or they can be mounted on cast iron bases with flexible couplings, with or without motors. Ball bearing thrust collars are provided at each end of the worm, which is made solid on the worm shaft. The housing is oiltight; therefore the drive can operate in lubricant continually.

The teeth of the gears are accurately cut on hobbing machines, and the threads of the worm are made on a thread miller. Every drive is provided with an oil gage, grease cups for the gear shaft bearings, stuffing boxes for the worm shaft, and an eyebolt to aid in transporting the drive.

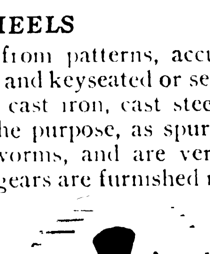


WORM GEAR SPEED REDUCER WITH MOTOR MOUNTED ON CAST IRON BASE

Our engineers will gladly assist in any speed reducing problem.

GEARS AND SPROCKET WHEELS

Jones cast gears are molded from patterns, accurately bored, faced on end of hub, and keyseated or setscrewed. They are furnished in cast iron, cast steel, or any other material used for the purpose, as spurs, bevels, miters, worm gears or worms, and are very serviceable for slow speeds. Cut gears are furnished in spurs, bevels, miters, worms, worm gears or spirals, made of cast iron, cast steel, forged steel, bronze, Bakelite, rawhide, or any other material used for the purpose. They can be used under working loads approximately one-third greater than is allowed for cast teeth. Send for our gear catalog, which lists about 2,000 standard patterns.



JONES SPUR GEAR

Continued on Next Page

JANTZ & LEIST ELECTRIC CO.

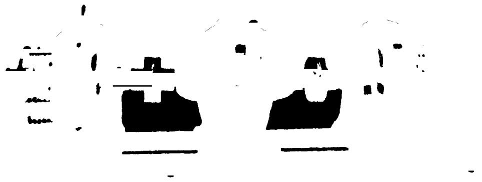
Manufacturers of

Electric Motors and Generators

WESTERN AVE., AND YORK ST., CINCINNATI, OHIO

PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.



MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

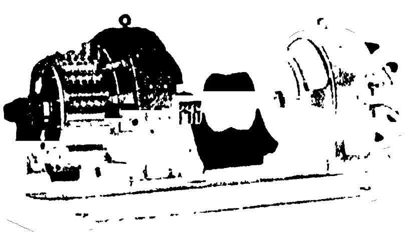
A C Set Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor Generators and motor mounted on substantial base rails, with exciter attached

D C Set Consists of two direct current low voltage generators and one direct current motor, motor either 115 230 or 550 volts Shunt rheostat for each generator and "no voltage" automatic release starter for the motor Generators and motors mounted on substantial iron base rails

Operation A C				Motor H P	Operation D C				Motor H P
Parallel		Series			Parallel		Series		
Amps	Volts	Amps	Volts		Amps	Volts	Amps	Volts	
2400	3-6	1200	6-12	35	2400	3-6	1200	6-12	28
3200	3-6	1600	6-12	50	3200	3-6	1600	6-12	40
4000	3-6	2000	6-12	50	4000	3-6	2000	6-12	50
5000	3-6	2500	6-12	60	5000	3-6	2500	6-12	60
7000	3-6	3500	6-12	100	7000	3-6	3500	6-12	85
8000	5-10	4000	10-20	150	8000	3-6	4000	6-12	100
10000	4-8	5000	8-16	150	10000	2-8	5000	4-16	150

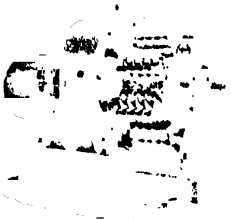
ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached With each generator we furnish a shunt rheostat, with the larger motors a compensator



DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator Motors standard voltages, either 110 to 125 or 220 to 250 volts Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor

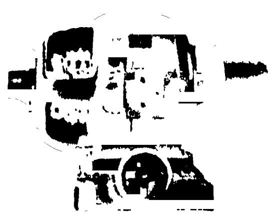


DIRECT CURRENT BELTED TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEOSTAT

Amperes	Volts	R P M
175	2-5	900
	3-7	1200
400	2-5	720
	4-8	1200
600	2-6	720
	4-8	900
800	2-6	720
	4-8	900
1200	2-6	600
	4-8	720
1600	2-6	550
	4-8	600
	5-10	720
	6-12	800
2000	2-6	550
	4-8	600
	5-10	720
	6-12	800
2500	3-6	475
	4-8	500
	5-10	600
	6-12	720
3500	3-6	425
	4-8	475
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

DATA MOTOR GENERATOR SETS

		A C Set		D C Set	
Amps	Volts	Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	4-8	7½	1200	7½	1200
600	2-6	7½	720	7½	720
	4-8	10	900	10	900
800	2-6	10	720	10	720
	4-8	15	900	15	900
1200	2-6	15	600	15	600
	4-8	20	720	20	720
1600	2-6	20	600	20	600
	4-8	25	600	27	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	4-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	4-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	4-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	600
5000	3-8	75	450	75	450



115 230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty

From 1 H P to 100 H P

		Standard Pulley		
H P	R P M	Dia	Face	Bore
1	450	4	3	$1\frac{3}{16}$
	230	5	4	$1\frac{5}{16}$
2	875	4	4	$1\frac{3}{16}$
	400	5	4	$1\frac{5}{16}$
	240	5	4	$1\frac{5}{16}$
	220	6	5	$1\frac{7}{16}$
2.5	1000	5	3	$1\frac{3}{16}$
	475	5	4	$1\frac{5}{16}$
	375	5	4	$1\frac{5}{16}$
	250	6	6	$1\frac{7}{16}$
3	1350	5	3	$1\frac{3}{16}$
	550	6	4	$1\frac{5}{16}$
	430	6	4	$1\frac{5}{16}$
	285	7	5	$1\frac{7}{16}$
3.5	625	5	5	$1\frac{5}{16}$
	500	5	5	$1\frac{5}{16}$
4	375	8	5	$1\frac{7}{16}$
5	1000	5	5	$1\frac{5}{16}$
	750	6	5	$1\frac{5}{16}$
	400	8	5	$1\frac{7}{16}$
	300	9	6	$1\frac{7}{16}$
7.5	1800	5	4	$1\frac{5}{16}$
	1150	6	5	$1\frac{5}{16}$
	650	8	6	$1\frac{7}{16}$
	500	10	6	$1\frac{7}{16}$
	425	10	6	$1\frac{7}{16}$
10	1700	8	5	$1\frac{5}{16}$
	1000	8	5	$1\frac{7}{16}$
	750	8	6	$1\frac{7}{16}$
	600	8	6	$1\frac{7}{16}$
	400	10	8	$1\frac{15}{16}$
15	1350	7	6	$1\frac{7}{16}$
	1050	8	8	$1\frac{15}{16}$
	850	10	6	$1\frac{15}{16}$
	575	10	8	$1\frac{15}{16}$
	490	12	8	$1\frac{15}{16}$
20	800	10	8	$1\frac{15}{16}$
	525	12	8	$1\frac{15}{16}$
	325	16	10	$2\frac{3}{16}$
30	1200	10	8	$1\frac{15}{16}$
	1000	10	8	$1\frac{15}{16}$
	750	12	8	$2\frac{3}{16}$
35	850	12	10	$2\frac{3}{16}$
	625	12	10	$2\frac{3}{16}$
40	525	14	10	$2\frac{11}{16}$
50	675	14	12	$2\frac{11}{16}$
60	1000	14	12	$2\frac{11}{16}$
	435	20	16	$2\frac{11}{16}$
75	575	20	16	$2\frac{11}{16}$
100	800	20	18	$2\frac{11}{16}$

115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P to 15 H P

		Efficiency		
H. P	R. P. M	100%	75%	50%
5	1750	85	83	78.5
	1150	86	84.1	79.4
7½	1750	86.5	84.5	79.8
	1150	87	85	80
10	1750	87	85.2	80
	1150	87.2	85.3	80.5
15	1750	87.2	85.2	80.2
	1150	87.5	86	80.9
20	1750	88	86.1	80.6
	1150	88	86	81.3
25	1750	88.6	86.2	81.5
	1150	89	87.2	83
35	1750	89.3	87.8	83.3
	1150	89.7	88	84
40	1750	90	88.3	84.3
	1150	90.5	89.2	86.2
50	1750	91.	89.7	89
	1150	91	89.7	87
60	1750	91.2	90	87
	1150	91.3	90	87

JOHNSON SERVICE COMPANY

Temperature Regulation and Humidity Control

MILWAUKEE, WIS.

BRANCHES

Boston 18 Mass., 31 Waltham Street
Buffalo N. Y. 2 Erie County Bank Building
Chicago Ill. 177 North Dearborn Street
Cincinnati Ohio 405 Gwynne Building
Cleveland Ohio 2028 E. 23rd Street
Denver Colo. 517 Boston Building
Des Moines Iowa 210 Masonic Temple
Detroit Mich. 12 Montcalm Street West
Indianapolis Ind., 111 Pembroke Arcade
Kansas City Mo., 111 East Tenth Street
Milwaukee, Wis., 149 Michigan Street

Los Angeles, Cal. 605 Van Nuys Building
Minneapolis, Minn., 308 Third Avenue South
New York N. Y. 118 East Twenty eighth Street
Omaha Nebr., 609 Paxton Building
Philadelphia, Pa., 1521 Sansom Street
Pittsburgh Pa. Century Building
Portland Ore. 404 Failing Building
San Francisco, Cal., 417 Rialto Building
Seattle, Wash. 452 Colman Building
St. Louis, Mo., 14 North Twelfth Street
Salt Lake City, Utah, 301 Templeton Building

CANADIAN REPRESENTATIVE

JOHNSON TEMPERATURE REGULATING COMPANY OF CANADA, LIMITED

OFFICES

Calgary Alta. 605 Second Street West
Montreal Que., 284 Beaver Hall Hill
Toronto Ont., 118 Adelaide Street, West
Winnipeg, Man., 259 Stanley Street
Vancouver B. C., 550 Sixth Ave., W.

PRODUCTS AND SERVICES

Manufacturers of Thermostats and Other Apparatus for the Control of Temperature and Humidity, including:

Thermostats and Humidostats.

"Sylphon" Metal Diaphragm and Rubber Diaphragm Valves.

Air and Water Reducing Valves.

Pneumatic Switches or Push Buttons.

Engineers and Contractors for the Control of Temperature or Humidity for any purpose and over every range used in manufacturing purposes or buildings, furnishing and installing:

Temperature Controlling Apparatus for any and all kinds of heating and ventilating systems.

Temperature Controlling Apparatus for any industrial process requiring the medium of heat.

Control of Humidity in industrial processes requiring artificial humidity.

Temperature Control of hot water tanks and all liquids.

Control of Temperatures of refrigerating and cold storage plants.

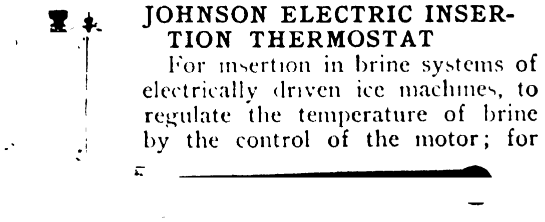
Thermostatic Control of electric motors on automatic refrigerating.

SPECIFIC APPLICATIONS OF TEMPERATURE CONTROL

Bake ovens for enamels, japans, etc.
Core drying ovens.
Drying room for paint, varnish, patent leather, etc.
Storage room for tobacco, rubber or similar goods
Cold storage rooms, fur vaults, etc
Canning machinery, cookers, exhausters, processors.
Corn and oats drying apparatus.
Fruit drying apparatus

JOHNSON ELECTRIC INSERTION THERMOSTAT

For insertion in brine systems of electrically driven ice machines, to regulate the temperature of brine by the control of the motor; for insertion through wall of refrigerator, to regulate temperature of cooled space by the control of motor; for regulation of temperature in electrically heated water system or tank, by control of heater; for regulation of temperature in electrically heated compartment, by control of the heater.



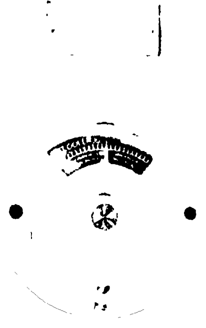
ELECTRIC INSERTION THERMOSTAT

JOHNSON PNEUMATIC INSERTION THERMOSTAT

Designed to control temperatures within closed air chambers or ducts. The body of thermostat is a dust-proof case containing the two working parts and extending outside the chamber.

This thermostat is made either positive or graduated acting.

Applications—Adaptable for use in bake ovens for enamels, japans, etc.; drying rooms for paints, varnishes, patent leather, etc.; storage rooms for tobacco, rubber or similar goods; sterilizers or pasteurizers; cold storage rooms, fur vaults, etc.; refrigerator machine control; humidity control for air washers; flue gas temperature control; hot blast heating plants; combination tempered ventilation and hot blast systems; greenhouses, turkish bath rooms, etc.; tempered ventilation for buildings.

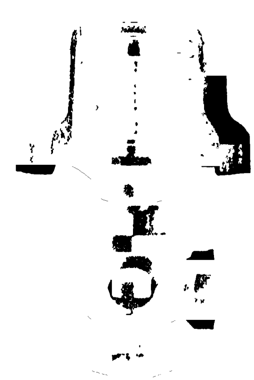


PNEUMATIC INSERTION THERMOSTAT

"SYLPHON" DIAPHRAGM VALVES

The metal diaphragm in this valve is the celebrated "Sylphon" seamless bellows patented and manufactured by The Fulton Company, and the Johnson Service Company is the only company authorized to use this bellows in the diaphragm valves which they furnish with their system.

It is made in all standard sizes and shapes. All small valves have heavy brass bodies and Jenkins discs. Larger valves are of the very best gray iron casting and have Jenkins discs. The valve is adaptable for any service and is practically indestructible through use.



"SYLPHON" METAL DIAPHRAGM VALVE

SERVICE

Service means emphatically the dictionary definition.

JANTZ & LEIST ELECTRIC CO.

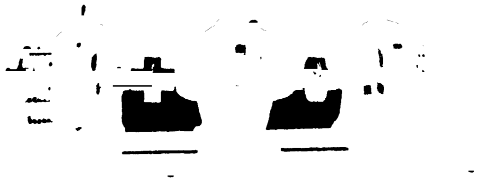
Manufacturers of

Electric Motors and Generators

WESTERN AVE., AND YORK ST., CINCINNATI, OHIO

PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.

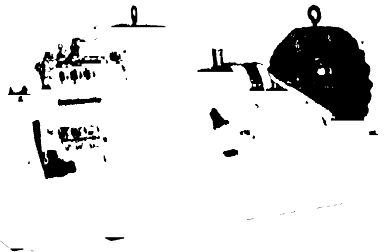


MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

A C Set—Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor. Generators and motor mounted on substantial base rails, with exciter attached

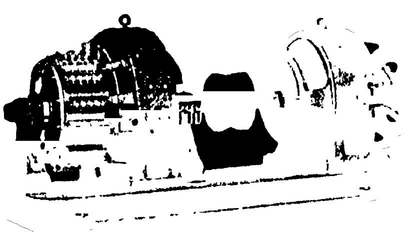
D C Set Consists of two direct current low voltage generators and one direct current motor, motor either 115-230 or 550 volts Shunt rheostat for each generator and "no voltage" automatic release starter for the motor Generators and motors mounted on substantial iron base rails

Operation A C				Motor H P	Operation D C				Motor H P
Parallel		Series			Parallel		Series		
Amps	Volts	Amps	Volts		Amps	Volts	Amps	Volts	
2400	3-6	1200	6-12	35	2400	3-6	1200	6-12	28
3200	3-6	1600	6-12	50	3200	3-6	1600	6-12	40
4000	3-6	2000	6-12	50	4000	3-6	2000	6-12	50
5000	3-6	2500	6-12	60	5000	3-6	2500	6-12	60
7000	3-6	3500	6-12	100	7000	3-6	3500	6-12	85
8000	5-10	4000	10-20	150	8000	3-6	4000	6-12	100
10000	4-8	5000	8-16	150	10000	2-8	5000	4-16	150



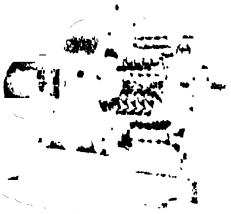
ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached With each generator we furnish a shunt rheostat, with the larger motors a compensator



DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator Motors standard voltages, either 110 to 125 or 220 to 250 volts Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor

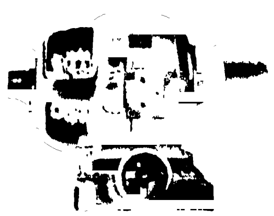


DIRECT CURRENT BELTED TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEOSTAT

Amperes	Volts	R P M
175	2-5	900
	3-7	1200
400	2-5	720
	4-8	1200
600	2-6	720
	4-8	900
800	2-6	720
	4-8	900
1200	2-6	600
	4-8	720
1600	2-6	550
	4-8	600
	5-10	720
	6-12	800
2000	2-6	550
	4-8	600
	5-10	720
	6-12	800
2500	3-6	475
	4-8	500
	5-10	600
	6-12	720
3500	3-6	425
	4-8	475
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	4-8	7½	1200	7½	1200
600	2-6	7½	720	7½	720
	4-8	10	900	10	900
800	2-6	10	720	10	720
	4-8	15	900	15	900
1200	2-6	15	600	15	600
	4-8	20	720	20	720
1600	2-6	20	600	20	600
	4-8	25	600	27	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	4-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	4-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	4-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	600
5000	3-8	75	450	75	450



115-230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty
From 1 H P to 100 H P

H P	R P M	Standard Pulley		
		Dia	Face	Bore
1	450	4	3	1 3/16
	230	5	4	1 5/16
2	875	4	4	1 3/16
	400	5	4	1 5/16
	240	5	4	1 5/16
	220	6	5	1 7/16
2.5	1000	5	3	1 3/16
	475	5	4	1 5/16
	475	5	4	1 5/16
	250	6	6	1 7/16
3	1350	5	3	1 3/16
	550	6	4	1 5/16
	430	6	4	1 5/16
	285	7	5	1 7/16
3.5	625	5	5	1 5/16
	500	5	5	1 5/16
4	375	8	5	1 7/16
5	1000	5	5	1 5/16
	750	6	5	1 5/16
	400	8	5	1 7/16
	300	9	6	1 7/16
7.5	1800	5	4	1 5/16
	1150	6	5	1 5/16
	650	8	6	1 7/16
	500	10	6	1 7/16
	425	10	6	1 7/16
10	1700	8	5	1 5/16
	1000	8	5	1 7/16
	750	8	6	1 7/16
	600	8	6	1 7/16
	400	10	8	1 15/16
15	1350	7	6	1 7/16
	1050	8	8	1 15/16
	850	10	6	1 15/16
	575	10	8	1 15/16
	490	12	8	1 15/16
20	800	10	8	1 15/16
	525	12	8	1 15/16
	325	16	10	2 3/16
30	1200	10	8	1 15/16
	1000	10	8	1 15/16
	750	12	8	2 5/16
35	850	12	10	2 3/16
	625	12	10	2 3/16
40	525	14	10	2 13/16
50	675	14	12	2 13/16
60	1000	14	12	2 13/16
	435	20	16	2 13/16
75	575	20	16	2 13/16
100	800	20	18	2 13/16

115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P to 15 H P

H. P	R. P. M	Efficiency		
		100%	75%	50%
5	1750	85	83	78.5
	1150	86	84.1	79.4
7½	1750	86.5	84.5	79.8
	1150	87	85	80
10	1750	87	85.2	80
	1150	87.2	85.3	80.5
15	1750	87.2	85.2	80.2
	1150	87.5	86	80.9
20	1750	88	86.1	80.6
	1150	88	86	81.3
25	1750	88.6	86.2	81.5
	1150	89	87.2	83
35	1750	89.3	87.8	83.3
	1150	89.7	88	84
40	1750	90	88.3	84.3
	1150	90.5	89.2	86.2
50	1750	91.	89.7	89
	1150	91	89.7	87
60	1750	91.2	90	87
	1150	91.3	90	87

JOHNSON SERVICE COMPANY

Temperature Regulation and Humidity Control

MILWAUKEE, WIS.

BRANCHES

Boston 18, Mass., 11 Waltham Street
Buffalo, N. Y., 2 Erie County Bank Building
Chicago, Ill., 177 North Dearborn Street
Cincinnati, Ohio, 405 Gwynne Building
Cleveland, Ohio, 2028 E. 23rd Street
Denver, Colo., 517 Boston Building
Des Moines, Iowa, 210 Masonic Temple
Detroit, Mich., 12 Montcalm Street, West
Indianapolis, Ind., 111 Pembroke Arcade
Kansas City, Mo., 111 East Tenth Street
Milwaukee, Wis., 149 Michigan Street

Los Angeles, Cal., 605 Van Nuys Building
Minneapolis, Minn., 308 Third Avenue South
New York, N. Y., 118 East Twenty-eighth Street
Omaha, Nebr., 609 Paxton Building
Philadelphia, Pa., 1521 Sansom Street
Pittsburgh, Pa., Century Building
Portland, Ore., 404 Failing Building
San Francisco, Cal., 417 Rialto Building
Seattle, Wash., 452 Colman Building
St. Louis, Mo., 14 North Twelfth Street
Salt Lake City, Utah, 301 Templeton Building

CANADIAN REPRESENTATIVE

JOHNSON TEMPERATURE REGULATING COMPANY OF CANADA, LIMITED

OFFICES

Calgary, Alta., 605 Second Street, West
Montreal, Que., 284 Beaver Hall Hill
Toronto, Ont., 118 Adelaide Street, West
Winnipeg, Man., 259 Stanley Street
Vancouver, B. C., 550 Sixth Ave., W.

PRODUCTS AND SERVICES

Manufacturers of Thermostats and Other Apparatus for the Control of Temperature and Humidity, including:

Thermostats and Humidostats.

"Sylphon" Metal Diaphragm and Rubber Diaphragm Valves.

Air and Water Reducing Valves.

Pneumatic Switches or Push Buttons.

Engineers and Contractors for the Control of Temperature or Humidity for any purpose and over every range used in manufacturing purposes or buildings, furnishing and installing:

Temperature Controlling Apparatus for any and all kinds of heating and ventilating systems.

Temperature Controlling Apparatus for any industrial process requiring the medium of heat.

Control of Humidity in industrial processes requiring artificial humidity.

Temperature Control of hot water tanks and all liquids.

Control of Temperatures of refrigerating and cold storage plants.

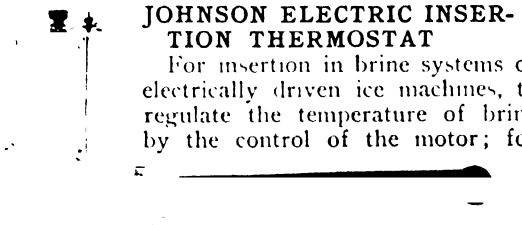
Thermostatic Control of electric motors on automatic refrigerating.

SPECIFIC APPLICATIONS OF TEMPERATURE CONTROL

Bake ovens for enamels, japans, etc.
Core drying ovens.
Drying room for paint, varnish, patent leather, etc.
Storage room for tobacco, rubber or similar goods
Cold storage rooms, fur vaults, etc
Canning machinery, cookers, exhausters, processors.
Corn and oats drying apparatus.
Fruit drying apparatus

JOHNSON ELECTRIC INSERTION THERMOSTAT

For insertion in brine systems of electrically driven ice machines, to regulate the temperature of brine by the control of the motor; for insertion through wall of refrigerator, to regulate temperature of cooled space by the control of motor; for regulation of temperature in electrically heated water system or tank, by control of heater; for regulation of temperature in electrically heated compartment, by control of the heater.



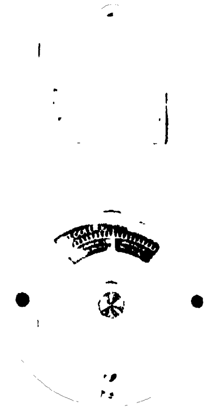
ELECTRIC INSERTION THERMOSTAT

JOHNSON PNEUMATIC INSERTION THERMOSTAT

Designed to control temperatures within closed air chambers or ducts. The body of thermostat is a dust-proof case containing the two working parts and extending outside the chamber.

This thermostat is made either positive or graduated acting.

Applications—Adaptable for use in bake ovens for enamels, japans, etc.; drying rooms for paints, varnishes, patent leather, etc.; storage rooms for tobacco, rubber or similar goods; sterilizers or pasteurizers; cold storage rooms, fur vaults, etc.; refrigerator machine control; humidity control for air washers; flue gas temperature control; hot blast heating plants; combination tempered ventilation and hot blast systems; greenhouses, turkish bath rooms, etc.; tempered ventilation for buildings.

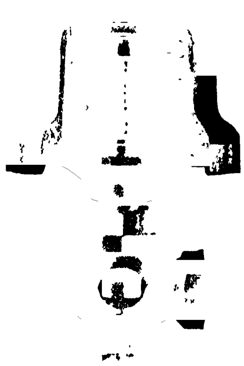


PNEUMATIC INSERTION THERMOSTAT

"SYLPHON" DIAPHRAGM VALVES

The metal diaphragm in this valve is the celebrated "Sylphon" seamless bellows patented and manufactured by The Fulton Company, and the Johnson Service Company is the only company authorized to use this bellows in the diaphragm valves which they furnish with their system.

It is made in all standard sizes and shapes. All small valves have heavy brass bodies and Jenkins discs. Larger valves are of the very best gray iron casting and have Jenkins discs. The valve is adaptable for any service and is practically indestructible through use.



"SYLPHON" METAL DIAPHRAGM VALVE

SERVICE

Service means emphatically the dictionary definition.

JANTZ & LEIST ELECTRIC CO.

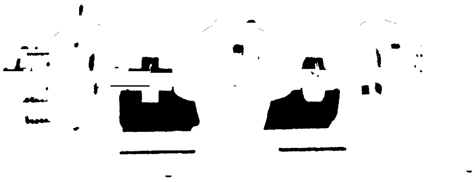
Manufacturers of

Electric Motors and Generators

WESTERN AVE., AND YORK ST., CINCINNATI, OHIO

PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.

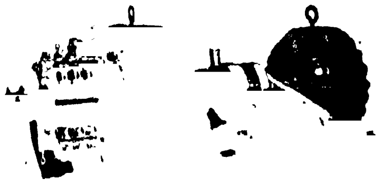


MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

A C Set Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor Generators and motor mounted on substantial base rails, with exciter attached

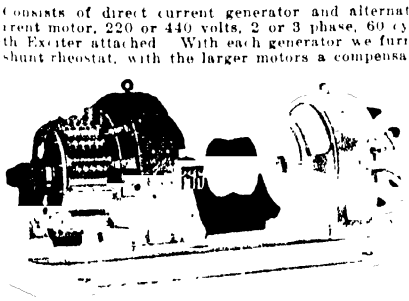
D C Set Consists of two direct current low voltage generators and one direct current motor, motor either 115 230 or 550 volts Shunt rheostat for each generator and "no voltage" automatic release starter for the motor Generators and motors mounted on substantial iron base rails

Operation A C				Motor H P	Operation D C				Motor H P
Parallel		Series			Parallel		Series		
Amps	Volts	Amps	Volts		Amps	Volts	Amps	Volts	
2400	3-6	1200	6-12	35	2400	3-6	1200	6-12	28
3200	3-6	1600	6-12	50	3200	3-6	1600	6-12	40
4000	3-6	2000	6-12	50	4000	3-6	2000	6-12	50
5000	3-6	2500	6-12	60	5000	3-6	2500	6-12	60
7000	3-6	3500	6-12	100	7000	3-6	3500	6-12	85
8000	5-10	4000	10-20	150	8000	3-6	4000	6-12	100
10000	4-8	5000	8-16	150	10000	2-8	5000	4-16	150



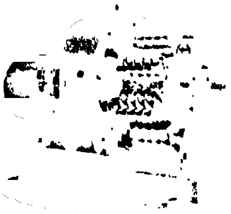
ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached With each generator we furnish a shunt rheostat, with the larger motors a compensator



DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator Motors standard voltages, either 110 to 125 or 220 to 250 volts Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor

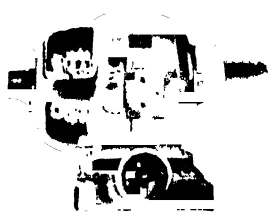


DIRECT CURRENT BELTED TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEOSTAT

Amperes	Volts	R P M
175	2-5	900
	3-7	1200
400	2-5	720
	4-8	1200
600	2-6	720
	4-8	900
800	2-6	720
	4-8	900
1200	2-6	600
	4-8	720
1600	2-6	550
	4-8	600
	5-10	720
	6-12	800
2000	2-6	550
	4-8	600
	5-10	720
	6-12	800
2500	3-6	475
	4-8	500
	5-10	600
	6-12	720
3500	3-6	425
	4-8	475
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	4-8	7½	1200	7½	1200
600	2-6	7½	720	7½	720
	4-8	10	900	10	900
800	2-6	10	720	10	720
	4-8	15	900	15	900
1200	2-6	15	600	15	600
	4-8	20	720	20	720
1600	2-6	20	600	20	600
	4-8	25	600	27	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	4-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	4-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	4-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	500
5000	3-8	75	450	75	450



115 230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty
From 1 H P to 100 H P

H P	R P M	Standard Pulley		
		Dia	Face	Bore
1	450	4	3	$1\frac{3}{16}$
	230	5	4	$1\frac{5}{16}$
2	875	4	4	$1\frac{3}{16}$
	400	5	4	$1\frac{5}{16}$
	240	5	4	$1\frac{5}{16}$
	220	6	5	$1\frac{7}{16}$
2.5	1000	5	3	$1\frac{3}{16}$
	475	5	4	$1\frac{5}{16}$
	375	5	4	$1\frac{5}{16}$
	250	6	6	$1\frac{7}{16}$
3	1350	5	3	$1\frac{3}{16}$
	550	6	4	$1\frac{5}{16}$
	430	6	4	$1\frac{5}{16}$
	285	7	5	$1\frac{7}{16}$
3.5	675	5	5	$1\frac{5}{16}$
	500	5	5	$1\frac{5}{16}$
4	375	8	5	$1\frac{7}{16}$
5	1000	5	5	$1\frac{5}{16}$
	750	6	5	$1\frac{5}{16}$
	400	8	5	$1\frac{7}{16}$
	300	9	6	$1\frac{7}{16}$
7.5	1800	5	4	$1\frac{5}{16}$
	1150	6	5	$1\frac{5}{16}$
	650	8	6	$1\frac{7}{16}$
	500	10	6	$1\frac{7}{16}$
	425	10	6	$1\frac{7}{16}$
10	1700	8	5	$1\frac{5}{16}$
	1000	8	5	$1\frac{7}{16}$
	750	8	6	$1\frac{7}{16}$
	600	8	6	$1\frac{7}{16}$
	400	10	8	$1\frac{15}{16}$
15	1350	7	6	$1\frac{7}{16}$
	1050	8	8	$1\frac{15}{16}$
	850	10	6	$1\frac{15}{16}$
	575	10	8	$1\frac{15}{16}$
	490	12	8	$1\frac{15}{16}$
20	800	10	8	$1\frac{15}{16}$
	525	12	8	$1\frac{15}{16}$
	325	16	10	$2\frac{3}{16}$
30	1200	10	8	$1\frac{15}{16}$
	1000	10	8	$1\frac{15}{16}$
	750	12	8	$2\frac{3}{16}$
35	850	12	10	$2\frac{3}{16}$
	625	12	10	$2\frac{3}{16}$
40	525	14	10	$2\frac{13}{16}$
50	675	14	12	$2\frac{13}{16}$
60	1000	14	12	$2\frac{13}{16}$
	435	20	16	$2\frac{13}{16}$
75	575	20	16	$2\frac{13}{16}$
100	800	20	18	$2\frac{13}{16}$

115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P to 15 H P

H. P	R. P. M	Efficiency		
		100%	75%	50%
5	1750	85	83	78.5
	1150	86	84.1	79.4
7½	1750	86.5	84.5	79.8
	1150	87	85	80
10	1750	87	85.2	80
	1150	87.2	85.3	80.5
15	1750	87.2	85.2	80.2
	1150	87.5	86	80.9
20	1750	88	86.1	80.6
	1150	88	86	81.3
25	1750	88.6	86.2	81.5
	1150	89	87.2	83
35	1750	89.3	87.8	83.3
	1150	89.7	88	84
40	1750	90	88.3	84.3
	1150	90.5	89.2	86.2
50	1750	91.	89.7	89
	1150	91	89.7	87
60	1750	91.2	90	87
	1150	91.3	90	87

E. KEELER COMPANY

Established 1864

Boilers and Steel Plate Work

WILLIAMSPORT, PA.

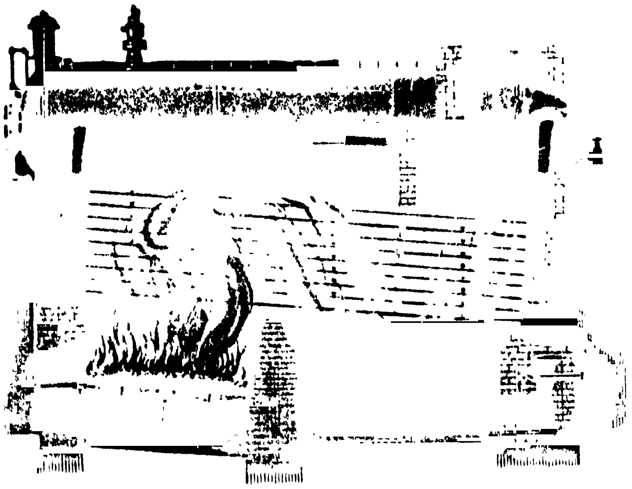
New York Buffalo Boston Philadelphia Portland, Ore Pittsburgh Cleveland Chicago

PRODUCTS

Manufacturers of Water Tube and Tubular Boilers
Steel Plate Work

KEELER WATER TUBE BOILERS

Standard Type—The arrangement of furnace, tubes, headers and drum in the Keeler Water Tube Boiler is efficient, accessible and compact. The superior efficiency of the Keeler Boiler rests upon correct proportions of heating and grate surface for the character of fuel to be burned, ample height of furnace, a superior arrangement of baffle walls and a perfect circulation. Every portion of the heating surface is accessible for both external and internal inspection, making it impossible for soot or scale to accumulate undetected. There is ample room between tubes and drum for inspection or repairs. Special patented side cleaning doors make it possible to observe the condition of the outside surface of the tubes. There is no part of the interior surface that cannot be examined and cleaned.

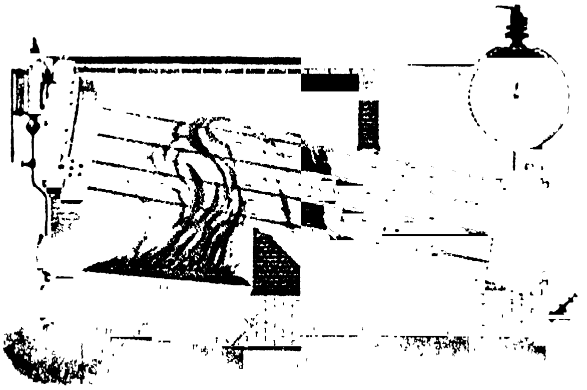


STANDARD TYPE WATER TUBE BOILER

Keeler Water Tube Boilers are usually built complete and tested in the shop. This reduces the cost of erection, as the boilers are handled as a unit. It also eliminates the dangers due to careless assembling of boilers in the field and makes the erection merely a matter of placing in position and attaching fittings.

Built in units 75 to 1500 H. P.

Cross Drum Type—The Keeler Cross Drum Water Tube Boiler is a modification of the standard design, only in the length and location of the drum and the method of connecting it to the headers. This type was developed to meet the demand for a high pressure water tube boiler that could be installed in Office Buildings, School Houses, Churches, Apartment Houses, Hotels and boiler rooms generally where ceiling height is limited or where the boiler must be introduced through narrow passageway or restricted openings.



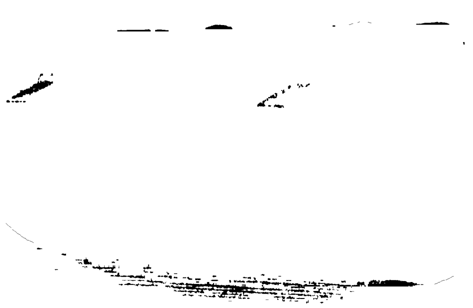
CROSS DRUM TYPE WATER TUBE BOILER

The pressure parts of the boiler are shipped in a knocked-down condition, making it possible to install it without cutting through walls and floors in locations that would be wholly inaccessible for almost any other type of boiler. If boilers are to be exported, the cross drum boiler can be handled at much less expense by steamship companies on account of its reduced bulk in a knocked-down condition, and the comparatively small weight of the heaviest piece.

Built in units 60 to 1000 H. P.

KEELER HORIZONTAL RETURN TUBULAR BOILERS

Our Return Tubular Boiler is the product of fifty-seven years' experience of boiler building. Tube holes are drilled from the solid plate, and not punched small and reamed to size. All seams are thoroughly caulked on the outside, and the end of butt straps are caulked on the inside. Braces are drop-forged.



HORIZONTAL RETURN TUBULAR BOILER

Steam and safety valve outlets are provided with wrought steel connections of an approved type. Manhole plates, yokes and brackets are of pressed steel. All boilers built to A. S. M. E. requirements.

FIFTY-SEVEN YEARS OF BOILER BUILDING

Ask for Catalogs.

JANTZ & LEIST ELECTRIC CO.

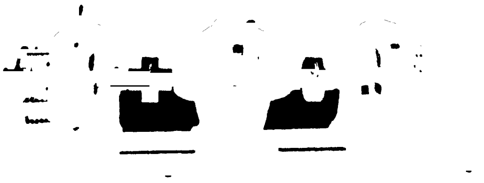
Manufacturers of

Electric Motors and Generators

WESTERN AVE., AND YORK ST., CINCINNATI, OHIO

PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.



MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

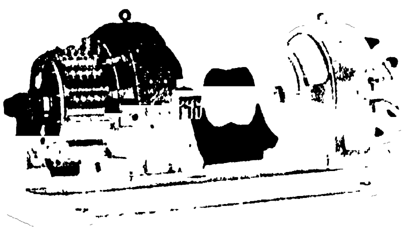
A C Set Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor Generators and motor mounted on substantial base rails, with exciter attached

D C Set Consists of two direct current low voltage generators and one direct current motor, motor either 115 230 or 550 volts Shunt rheostat for each generator and "no voltage" automatic release starter for the motor Generators and motors mounted on substantial iron base rails

Operation A C Parallel		Operation A C Series		Motor H P	Operation D C Parallel		Operation D C Series		Motor H P
Amps	Volts	Amps	Volts		Amps	Volts	Amps	Volts	
2400	3-6	1200	6-12	35	2400	3-6	1200	6-12	28
3200	3-6	1600	6-12	50	3200	3-6	1600	6-12	40
4000	3-6	2000	6-12	50	4000	3-6	2000	6-12	50
5000	3-6	2500	6-12	60	5000	3-6	2500	6-12	60
7000	3-6	3500	6-12	100	7000	3-6	3500	6-12	85
8000	5-10	4000	10-20	150	8000	3-6	4000	6-12	100
10000	4-8	5000	8-16	150	10000	2-8	5000	4-16	150

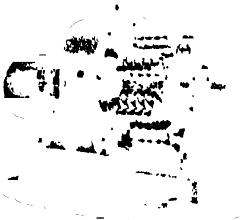
ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached With each generator we furnish a shunt rheostat, with the larger motors a compensator



DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator Motors standard voltages, either 110 to 125 or 220 to 250 volts Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor

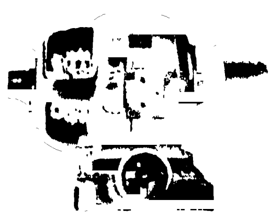


DIRECT CURRENT BELTED TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEOSTAT

Amperes	Volts	R P M
175	2-5	900
	3-7	1200
400	2-5	720
	4-8	1200
600	2-6	720
	4-8	900
800	2-6	720
	4-8	900
1200	2-6	600
	4-8	720
1600	2-6	550
	4-8	600
	5-10	720
	6-12	800
2000	2-6	550
	4-8	600
	5-10	720
	6-12	800
2500	3-6	475
	4-8	500
	5-10	600
	6-12	720
3500	3-6	425
	4-8	475
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set Motor H P	A C Set R P M	D C Set Motor H P	D C Set R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	4-8	7½	1200	7½	1200
600	2-6	7½	720	7½	720
	4-8	10	900	10	900
800	2-6	10	720	10	720
	4-8	15	900	15	900
1200	2-6	15	600	15	600
	4-8	20	720	20	720
1600	2-6	20	600	20	600
	4-8	25	600	27	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	4-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	4-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	4-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	600
5000	3-8	75	450	75	450



115 230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty
From 1 H P to 100 H P

H P	R P M	Standard Pulley Dia	Face	Bore
1	450	4	3	$1\frac{3}{16}$
	230	5	4	$1\frac{5}{16}$
2	875	4	4	$1\frac{3}{16}$
	400	5	4	$1\frac{5}{16}$
	240	5	4	$1\frac{5}{16}$
	220	6	5	$1\frac{7}{16}$
2.5	1000	5	3	$1\frac{3}{16}$
	475	5	4	$1\frac{5}{16}$
	375	5	4	$1\frac{5}{16}$
	250	6	6	$1\frac{7}{16}$
3	1350	5	3	$1\frac{3}{16}$
	550	6	4	$1\frac{5}{16}$
	430	6	4	$1\frac{5}{16}$
	285	7	5	$1\frac{7}{16}$
3.5	625	5	5	$1\frac{5}{16}$
	500	5	5	$1\frac{5}{16}$
4	375	8	5	$1\frac{7}{16}$
5	1000	5	5	$1\frac{5}{16}$
	750	6	5	$1\frac{5}{16}$
	400	8	5	$1\frac{7}{16}$
	300	9	6	$1\frac{7}{16}$
7.5	1800	5	4	$1\frac{5}{16}$
	1150	6	5	$1\frac{5}{16}$
	650	8	6	$1\frac{7}{16}$
	500	10	6	$1\frac{7}{16}$
	425	10	6	$1\frac{7}{16}$
10	1700	8	5	$1\frac{5}{16}$
	1000	8	5	$1\frac{7}{16}$
	750	8	6	$1\frac{7}{16}$
	600	8	6	$1\frac{7}{16}$
	400	10	8	$1\frac{15}{16}$
15	1350	7	6	$1\frac{7}{16}$
	1050	8	8	$1\frac{15}{16}$
	850	10	6	$1\frac{15}{16}$
	575	10	8	$1\frac{15}{16}$
	490	12	8	$1\frac{15}{16}$
20	800	10	8	$1\frac{15}{16}$
	525	12	8	$1\frac{15}{16}$
	325	16	10	$2\frac{3}{16}$
30	1200	10	8	$1\frac{15}{16}$
	1000	10	8	$1\frac{15}{16}$
	750	12	8	$2\frac{3}{16}$
35	850	12	10	$2\frac{3}{16}$
	625	12	10	$2\frac{3}{16}$
40	575	14	10	$2\frac{15}{16}$
50	675	14	12	$2\frac{15}{16}$
60	1000	14	12	$2\frac{15}{16}$
	435	20	16	$2\frac{15}{16}$
75	575	20	16	$2\frac{15}{16}$
100	800	20	18	$2\frac{15}{16}$

115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P to 15 H P

H. P	R. P. M	Efficiency 100%	75%	50%
5	1750	85	83	78.5
	1150	86	84.1	79.4
7½	1750	86.5	84.5	79.8
	1150	87	85	80
10	1750	87	85.2	80
	1150	87.2	85.3	80.5
15	1750	87.2	85.2	80.2
	1150	87.5	86	80.9
20	1750	88	86.4	80.6
	1150	88	86	81.3
25	1750	88.6	86.2	81.5
	1150	89	87.2	83
35	1750	89.3	87.8	83.3
	1150	89.7	88	84
40	1750	90	88.3	84.3
	1150	90.5	89.2	86.2
50	1750	91.	89.7	89
	1150	91	89.7	87
60	1750	91.2	90	87
	1150	91.3	90	87

THE M. W. KELLOGG COMPANY

Kellogg Forge-Welded Equipment (Chemi-Steel)

90 West Street
NEW YORK, N. Y.

Cable Address
MONOLOGG, New York

PRODUCTS

- Acid Eggs
- Autoclaves
- Gray Iron Castings
- Chlorine Containers
- Barometric Condensers
- Cyanide Pots
- Pulp Digesters
- Rotary Dryers
- Grease Kettles
- Caustic Kettles
- Mixers, Forge Welded
- Nitrators
- Niter Pots
- Pans, Forge Welded
- Pots, All Kinds
- Reducers
- Retorts
- Acid Stills
- Oil Still, High Pressure
- Sulphonators
- Tanks, Forge Welded
- Tanks, Tank Car
- Vacuum Pans
- Washers, Acid, Benzol, etc.
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- Steam Plant Specialties
- Power Piping
- Sugar Mill Piping
- Chimneys
- Piping Contractors
- Fittings
- Penstocks, High Head, Forge Welded
- Paper and Pulp Mill Equipment
- Petroleum Refineries, Complete
- Vulcanizers
- Experimental Equipment, Forged Steel

"CHEMI-STEEL"

The advantages of Chemical Equipment constructed of acid resistant steel instead of brittle cast iron are obvious. Nitrators and Sulphonators can be water or steam jacketed with entire safety due to the elimination of cast iron in their construction. Autoclaves can be used at pressures and for corrosive materials heretofore unthought of.

The M. W. Kellogg Company has, after many years of investigation, developed "Chemi-Steel," a mild steel of special analysis which has much greater acid resistant properties than the highest quality gray cast iron.

"Chemi-Steel" is used in all Kellogg Forge-Welded Equipment as its high tensile strength and unusually high elastic limit make it readily adaptable for all classes of work.

The brochure, "Corrosion Tests on Chemi-Steel," will gladly be sent you for your inspection.

KELLOGG FORGE-WELDED EQUIPMENT

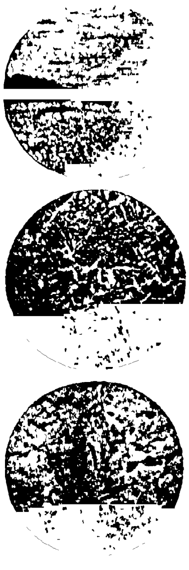
No matter how resistant the construction material may be to the action of reagents, it is often rendered valueless by the method of fabrication.

Riveted joints cannot be made tight. The rivets become loosened from expansion and contraction due to change in pressure or temperature. Even at the best, there is always a gasket of iron oxide between the plates and around the rivets which is easily attacked by acids and alkalis.

The upper photomicrograph is of a riveted joint (50 Diameters). Note the gasket of iron oxide between the two plates. This is readily attacked by acids or alkalis and is one of the most frequent causes of breakdown of the riveted joint.

The middle photograph (50 Diameters) is of an electric weld and shows plainly the coarse crystalline structure. Such a structure readily breaks down under variable stresses due to "metal fatigue." In addition, it is open to attack by reagents.

The lower photograph (50 Diameters) is of a Kellogg Forge-Welded Joint and illustrates the perfect homogeneity of the joint. In fact, a careful microscopic examination discloses the fact that there is no joint, but a true seamless construction.



MICROPHOTOGRAPHS OF JOINTS

Electric or Autogenous welding, on account of rapid cooling from high temperatures, has a coarse crystal-

Continued on Next Page

JANTZ & LEIST ELECTRIC CO.

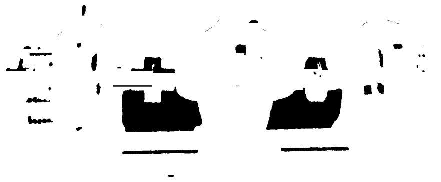
Manufacturers of

Electric Motors and Generators

WESTERN AVE., AND YORK ST., CINCINNATI, OHIO

PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.



MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

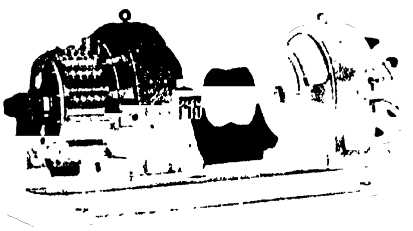
A C Set Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor Generators and motor mounted on substantial base rails, with exciter attached

D C Set Consists of two direct current low voltage generators and one direct current motor, motor either 115 230 or 550 volts Shunt rheostat for each generator and "no voltage" automatic release starter for the motor Generators and motors mounted on substantial iron base rails

Operation A C				Motor H P	Operation D C				Motor H P
Parallel		Series			Parallel		Series		
Amps	Volts	Amps	Volts		Amps	Volts	Amps	Volts	
2400	3-6	1200	6-12	35	2400	3-6	1200	6-12	28
3200	3-6	1600	6-12	50	3200	3-6	1600	6-12	40
4000	3-6	2000	6-12	50	4000	3-6	2000	6-12	50
5000	3-6	2500	6-12	60	5000	3-6	2500	6-12	60
7000	3-6	3500	6-12	100	7000	3-6	3500	6-12	85
8000	5-10	4000	10-20	150	8000	3-6	4000	6-12	100
10000	4-8	5000	8-16	150	10000	2-8	5000	4-16	150

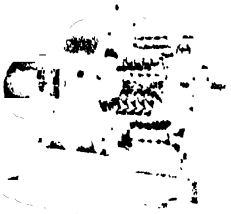
ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached With each generator we furnish a shunt rheostat, with the larger motors a compensator



DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator Motors standard voltages, either 110 to 125 or 220 to 250 volts Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor

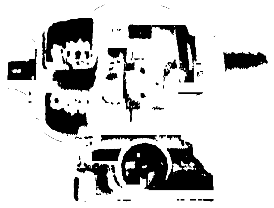


DIRECT CURRENT BELTED TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEOSTAT

Amperes	Volts	R P M
175	2-5	900
	3-7	1200
400	2-5	720
	4-8	1200
600	2-6	720
	4-8	900
800	2-6	720
	4-8	900
1200	2-6	600
	4-8	720
1600	2-6	550
	4-8	600
	5-10	720
	6-12	800
2000	2-6	550
	4-8	600
	5-10	720
	6-12	800
2500	3-6	475
	4-8	500
	5-10	600
	6-12	720
3500	3-6	425
	4-8	475
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	4-8	7½	1200	7½	1200
600	2-6	7½	720	7½	720
	4-8	10	900	10	900
800	2-6	10	720	10	720
	4-8	15	900	15	900
1200	2-6	15	600	15	600
	4-8	20	720	20	720
1600	2-6	20	600	20	600
	4-8	25	600	27	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	4-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	4-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	4-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	600
5000	3-8	75	450	75	450



115 230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty
From 1 H P to 100 H P

H P	R P M	Standard Pulley		
		Dia	Face	Bore
1	450	4	3	1 3/16
	230	5	4	1 5/16
2	875	4	4	1 3/16
	400	5	4	1 5/16
	240	5	4	1 5/16
	220	6	5	1 7/16
2 5	1000	5	3	1 3/16
	475	5	4	1 5/16
	375	5	4	1 5/16
	250	6	6	1 7/16
3	1350	5	3	1 3/16
	550	6	4	1 5/16
	430	6	4	1 5/16
	285	7	5	1 7/16
3 5	625	5	5	1 5/16
	500	5	5	1 5/16
4	335	8	5	1 7/16
5	1000	5	5	1 5/16
	750	6	5	1 5/16
	400	8	5	1 7/16
	300	9	6	1 7/16
7 5	1800	5	4	1 5/16
	1150	6	5	1 5/16
	650	8	6	1 7/16
	500	10	6	1 7/16
	425	10	6	1 7/16
10	1700	8	5	1 5/16
	1000	8	5	1 7/16
	750	8	6	1 7/16
	600	8	6	1 7/16
	400	10	8	1 15/16
15	1350	7	6	1 7/16
	1050	8	8	1 15/16
	850	10	6	1 15/16
	575	10	8	1 15/16
	490	12	8	1 15/16
20	800	10	8	1 15/16
	525	12	8	1 15/16
	325	16	10	2 3/16
30	1200	10	8	1 15/16
	1000	10	8	1 15/16
	750	12	8	2 3/16
35	850	12	10	2 3/16
	625	12	10	2 3/16
40	525	14	10	2 13/16
50	675	14	12	2 13/16
60	1000	14	12	2 13/16
	435	20	16	2 13/16
75	575	20	16	2 13/16
100	800	20	18	2 13/16

115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P to 15 H P

H. P	R. P. M	Efficiency		
		100%	75%	50%
5	1750	85	83	78 5
	1150	86	84 1	79 4
7½	1750	86 5	84 5	79 8
	1150	87	85	80
10	1750	87	85 2	80
	1150	87 2	85 3	80 5
15	1750	87 2	85 2	80 2
	1150	87 5	86	80 9
20	1750	88	86 4	80 6
	1150	88	86	81 3
25	1750	88 6	86 2	81 5
	1150	89	87 2	83
35	1750	89 3	87 8	83 3
	1150	89 7	88	84
40	1750	90	88 3	84 3
	1150	90 5	89 2	86 2
50	1750	91 .	89 7	89
	1150	91	89.7	87
60	1750	91 2	90	87
	1150	91 3	90	87

THE KELLY & JONES COMPANY

Chemical Engineering Equipment, Brass, Iron and Steel Valves, Fittings and Cocks

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GREENSBURG, PA.

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155 North Clark Street

ST. LOUIS, 705 Laclede Gas Building
CINCINNATI, 1008-12 Sycamore Street
SAN FRANCISCO, Fifth and Bluxome Streets
BUFFALO, 572 Ellicott Square

PRODUCTS

A complete line of Valves, Pipe Fittings and Specialties for the Chemical Industry including Cast Iron, Malleable, Brass and Steel Fittings; Brass, Iron and Steel Valves and Cocks; Wrought Pipe and Nipples; Engine and Boiler Trimmings; Expansion Joints; Specialties, Etc., for Acid, Alkalies, Ammonia, Benzol, Steam, Gas, Water, Air and Oil.

CO-OPERATIVE SERVICE

TRADE MARK

We gladly offer the services of our engineers to the engineers using this catalogue, if in any way, by advice or suggestion, we could be of service to them.

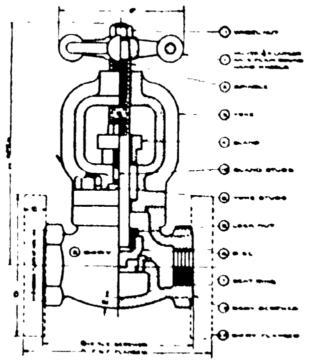
TESTS

Our chemists make daily tests of all raw material entering into the manufacture of our goods All work is carefully tested and inspected throughout the process of manufacture and after completion, thus insuring a finished product that is as near perfection as it is possible to make

ACID GLOBE VALVE

This acid globe valve is a heavy, well made valve and was designed especially for the Chemical trade Can be furnished in either all Iron or all Steel and all the parts, including the seats and discs, are renewable In opening this valve the spindles are screwed out of the body, free of the acid, through the yoke

ACID GLOBE VALVE



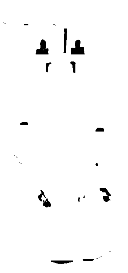
SECTIONAL DETAIL ACID GLOBE VALVE

Made in all sizes from ½″ to 4″ screwed or flanged 1¼″ and larger furnished with a plain round hand wheel and the smaller sizes with the Ball Pattern Wheel.

Separate parts for this valve can be ordered by specifying the part numbers shown in the sectional.

ALL IRON STRAIGHTWAY VALVES

These all iron valves are specially adapted for service where temperature exceeds 325° F and for handling cyanides, acids and other solutions, which are injurious to brass



SCREWED

FLANGED

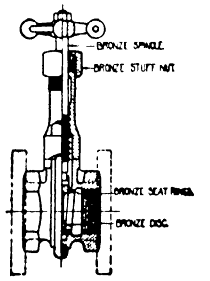
The guides on the discs and ribs in the body are so constructed as to insure an easy movement of the disc and eliminate all possible danger of the disc coming in contact with the seat, except at the point of closing

We also make a complete line of Iron Body Brass Mounted and Steel Straightway Valves for all pressures and purposes

SADDLE TYPE STRAIGHTWAY VALVES

This saddle style is a very durable and compact valve and economical owing to the simplicity of construction The Steel saddle around the body of the valve holds the Bonnet securely in place and can be easily removed, permitting of access to the interior of valve for cleaning and repair purposes

SADDLE VALVE



SECTIONAL VIEW SADDLE VALVE

Can be furnished either black or red japanned in all iron body brass mounted. The all-iron style is highly recommended for use in connection with Cyanide, Benzol, Creosote, etc. Recommended for 125 pounds working pressure.

Continued on Next Page

JANTZ & LEIST ELECTRIC CO.

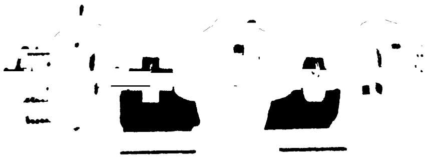
Manufacturers of

Electric Motors and Generators

WESTERN AVE., AND YORK ST., CINCINNATI, OHIO

PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.

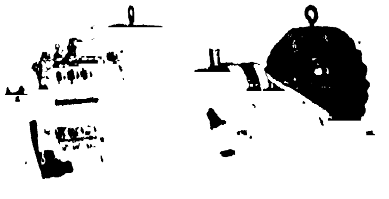


MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

A C Set Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor Generators and motor mounted on substantial base rails, with exciter attached

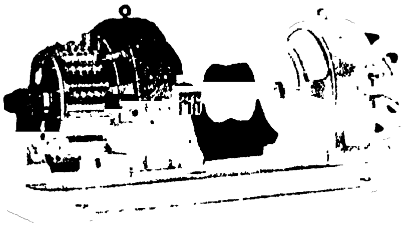
D C Set Consists of two direct current low voltage generators and one direct current motor, motor either 115 230 or 550 volts Shunt rheostat for each generator and "no voltage" automatic release starter for the motor Generators and motors mounted on substantial iron base rails

Operation A C				Motor H P	Operation D C				Motor H P
Parallel		Series			Parallel		Series		
Amps	Volts	Amps	Volts		Amps	Volts	Amps	Volts	
2400	3-6	1200	6-12	35	2400	3-6	1200	6-12	28
3200	3-6	1600	6-12	50	3200	3-6	1600	6-12	40
4000	3-6	2000	6-12	50	4000	3-6	2000	6-12	50
5000	3-6	2500	6-12	60	5000	3-6	2500	6-12	60
7000	3-6	3500	6-12	100	7000	3-6	3500	6-12	85
8000	5-10	4000	10-20	150	8000	3-6	4000	6-12	100
10000	4-8	5000	8-16	150	10000	2-8	5000	4-16	150



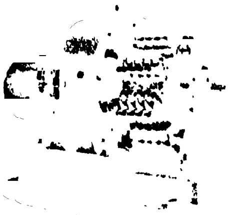
ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached With each generator we furnish a shunt rheostat, with the larger motors a compensator



DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator Motors standard voltages, either 110 to 125 or 220 to 250 volts Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor

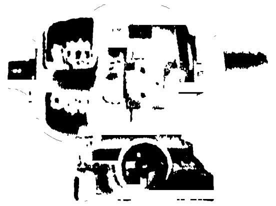


DIRECT CURRENT BELTED TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEOSTAT

Amperes	Volts	R P M
175	2-5	900
	3-7	1200
400	2-5	720
	4-8	1200
600	2-6	720
	4-8	900
800	2-6	720
	4-8	900
1200	2-6	600
	4-8	720
1600	2-6	550
	4-8	600
	5-10	720
	6-12	800
2000	2-6	550
	4-8	600
	5-10	720
	6-12	800
2500	3-6	175
	4-8	500
	5-10	600
	6-12	720
3500	3-6	125
	4-8	175
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	4-8	7½	1200	7½	1200
600	2-6	7½	720	7½	720
	4-8	10	900	10	900
800	2-6	10	720	10	720
	4-8	15	900	15	900
1200	2-6	15	600	15	600
	4-8	20	720	20	720
1600	2-6	20	600	20	600
	4-8	25	600	27	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	4-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	4-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	4-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	500
5000	3-8	75	450	75	450



115 230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty

From 1 H P to 100 H P

H P	R P M	Standard Pulley		
		Dia	Face	Bore
1	150	4	3	$1\frac{3}{16}$
	230	5	4	$1\frac{5}{16}$
2	875	4	4	$1\frac{3}{16}$
	400	5	4	$1\frac{5}{16}$
	240	5	4	$1\frac{5}{16}$
	220	6	5	$1\frac{7}{16}$
2 5	1000	5	3	$1\frac{3}{16}$
	475	5	4	$1\frac{5}{16}$
	375	5	4	$1\frac{5}{16}$
	250	6	6	$1\frac{7}{16}$
3	1350	5	3	$1\frac{3}{16}$
	550	6	4	$1\frac{5}{16}$
	430	6	4	$1\frac{5}{16}$
	285	7	5	$1\frac{7}{16}$
3 5	675	5	5	$1\frac{5}{16}$
	500	5	5	$1\frac{5}{16}$
4	375	8	5	$1\frac{7}{16}$
5	1000	5	5	$1\frac{5}{16}$
	750	6	5	$1\frac{5}{16}$
	400	8	5	$1\frac{7}{16}$
	300	9	6	$1\frac{7}{16}$
7 5	1800	5	4	$1\frac{5}{16}$
	1150	6	5	$1\frac{5}{16}$
	650	8	6	$1\frac{7}{16}$
	500	10	6	$1\frac{7}{16}$
	425	10	6	$1\frac{7}{16}$
10	1700	8	5	$1\frac{5}{16}$
	1000	8	5	$1\frac{7}{16}$
	750	8	6	$1\frac{7}{16}$
	600	8	6	$1\frac{7}{16}$
	400	10	8	$1\frac{15}{16}$
15	1350	7	6	$1\frac{7}{16}$
	1050	8	8	$1\frac{15}{16}$
	850	10	6	$1\frac{15}{16}$
	575	10	8	$1\frac{15}{16}$
	490	12	8	$1\frac{15}{16}$
20	800	10	8	$1\frac{15}{16}$
	525	12	8	$1\frac{15}{16}$
	325	16	10	$2\frac{3}{16}$
30	1200	10	8	$1\frac{15}{16}$
	1000	10	8	$1\frac{15}{16}$
	750	12	8	$2\frac{3}{16}$
35	850	12	10	$2\frac{3}{16}$
	625	12	10	$2\frac{3}{16}$
40	575	14	10	$2\frac{13}{16}$
50	675	14	12	$2\frac{13}{16}$
60	1000	14	12	$2\frac{13}{16}$
	435	20	16	$2\frac{13}{16}$
75	575	20	16	$2\frac{13}{16}$
100	800	20	18	$2\frac{13}{16}$

115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P to 15 H P

H. P	R. P. M	Efficiency		
		100%	75%	50%
5	1750	85	83	78.5
	1150	86	84.1	79.4
7½	1750	86.5	84.5	79.8
	1150	87	85	80
10	1750	87	85.2	80
	1150	87.2	85.3	80.5
15	1750	87.2	85.2	80.2
	1150	87.5	86	80.9
20	1750	88	86.1	80.6
	1150	88	86	81.3
25	1750	88.6	86.2	81.5
	1150	89	87.2	83
35	1750	89.3	87.8	83.3
	1150	89.7	88	84
40	1750	90	88.3	84.3
	1150	90.5	89.2	86.2
50	1750	91.	89.7	89
	1150	91	89.7	87
60	1750	91.2	90	87
	1150	91.3	90	87

THE C. M. KEMP MANUFACTURING CO.

Manufacturers of

Kemp Automatic Gas System

405-417 EAST OLIVER STREET, BALTIMORE, MD.

PRODUCTS

Kemp Automatic Gas System and Specially designed Burners for all Industrial uses.

SERVICES

We have engineers at your service to consult with you on your gas heating problems. We have the facilities for designing and building our gas system to meet the most rigid specifications.

THE KEMP AUTOMATIC GAS SYSTEM

Is an improved method of utilizing municipal gas, whether manufactured or natural, for factory fuel purposes, for all mechanical processes and operations in which uniformity of pressure, temperature control, safety, reliability and economy in application of fuel are factors. It is the most modern and efficient means of applying gaseous fuel to furnaces, retorts, crucibles, ovens, etc., and for soldering, brazing, tempering, welding, chemical laboratory work, as well as producing intense illumination with incandescent burners. By the Kemp System actual savings in gas consumption of from 25 per cent to 75 per cent are made.

Municipal or producer gas and air are automatically mixed in predetermined ratio, in exact amount to supply the current demand, and are compressed to pressure of from one to three pounds per square inch, depending upon the character of work to be performed.

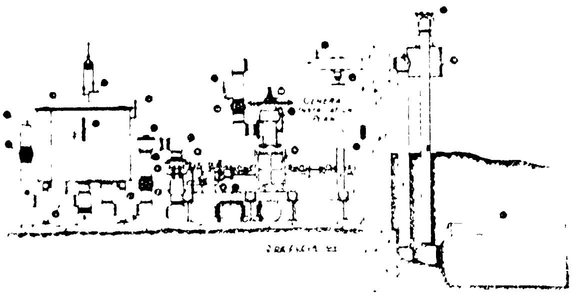
The ratio of air and gas can be instantly changed at will. For most mechanical purposes the mixture is delivered to the burners under pressure of one pound. No air is mixed at the burner. All the mixing is done in the machine. The intensity of the heat is adjusted by one valve, which controls the flow of gas to the burner.

Machine can be located in basement or on any floor of the building. Occupies little floor space or can be suspended from ceiling. Requires no more power than the ordinary fan or blower.

No matter how large or small your gas consumption, it may be greatly to your interest to communicate with us.

GENERAL INSTALLATION PLAN

The General Installation Plan of the Kemp System shows the parts located inside and those outside the building. The machine proper consists of a water seal gas receiver "B" resting on a metal stand to which the gas from the meter is fed through the pipe "A." This receiver serves as a reservoir and a pressure governor. Whether the incoming gas is at a pressure of two or three inches water column or six to eight ounces, it is reduced by this receiver to one and half inch water column and at this pressure is fed through the pipe "H" and the check valve "C" to the apparatus proper. The cut shows but one side of the machine. Directly opposite the valve "C" there is another valve which controls the air inlet. These valves are mounted on the top of an inlet chamber on which is also mounted double port slide valves similar in construction to those of a steam engine. These valves are operated in unison. They are of the same area but the proportion of air and gas is affected by timing them. For instance, if five parts of air and one part of gas are wanted, the roller is placed in such position on the cam drum that the air valve is held open five times as long as the gas valve. Air and gas are drawn in alternately passing through the check valve "J" and into the gas pump "K" at the bottom. They are compressed and discharged from the top of the pump. The pressure of the discharged air and gas mixture is controlled by the diaphragm valve "W." On the opposite side of the gas pump is a bypass valve through which a portion of the air and gas mixture is returning to the inlet side of the pump. The pump is always compressing a greater volume than is required and there is a portion of the mixture in circulation. This assures even pressure and complete mixing. The gas and air mixture then passes through the pipe "X" to the outside of the building where it goes into the expansion tank "U." From this tank it passes through the check valve "O," back fire preventor "R" and into the burners. The apparatus operates at a constant speed whether one or many burners are in operation; is set to produce the desired quality of mixture by placing the roller on such position of the cam drum as to give the desired ratio of air and gas. This roller can be changed at will without interruption to the service, but when once adjusted, the same quality of mixture is maintained whether many or few burners are in operation. Machine requires no attention other than an oiling once a day. So accurately does it proportion the air and gas that a neutral furnace atmosphere can be produced and maintained almost indefinitely or until the quality of the incoming gas varies sufficiently to alter the character of mixture set up by the apparatus. The ratio of air and gas delivered by our machine will not vary unless manually changed.



GENERAL INSTALLATION PLAN OF A KEMP GAS SYSTEM

CAPACITIES

The Kemp System is made in sizes of from 300 cubic feet per hour to 10,000 cubic feet per hour, and can be installed in batteries of as many of the large size as are necessary. In stating capacities of machines in

Continued on Next Page

JANTZ & LEIST ELECTRIC CO.

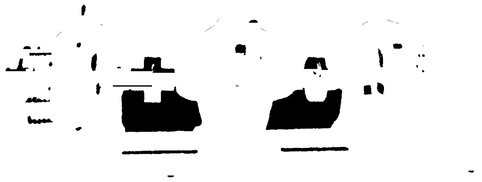
Manufacturers of

Electric Motors and Generators

WESTERN AVE., AND YORK ST., CINCINNATI, OHIO

PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.



MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

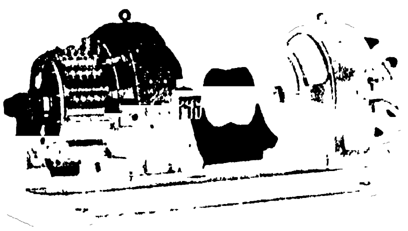
A C Set- Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor Generators and motor mounted on substantial base rails, with exciter attached

D C Set Consists of two direct current low voltage generators and one direct current motor, motor either 115 230 or 550 volts Shunt rheostat for each generator and "no voltage" automatic release starter for the motor Generators and motors mounted on substantial iron base rails

Operation A C				Motor H P	Operation D C				Motor H P
Parallel		Series			Parallel		Series		
Amps	Volts	Amps	Volts		Amps	Volts	Amps	Volts	
2400	3-6	1200	6-12	35	2400	3-6	1200	6-12	28
3200	3-6	1600	6-12	50	3200	3-6	1600	6-12	40
4000	3-6	2000	6-12	50	4000	3-6	2000	6-12	50
5000	3-6	2500	6-12	60	5000	3-6	2500	6-12	60
7000	3-6	3500	6-12	100	7000	3-6	3500	6-12	85
8000	5-10	4000	10-20	150	8000	3-6	4000	6-12	100
10000	4-8	5000	8-16	150	10000	2-8	5000	4-16	150

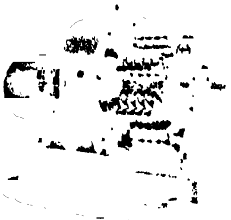
ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached With each generator we furnish a shunt rheostat, with the larger motors a compensator



DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator Motors standard voltages, either 110 to 125 or 220 to 250 volts Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor

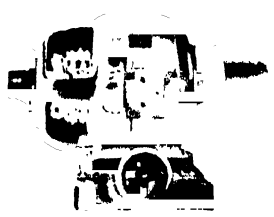


DIRECT CURRENT BELTED TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEOSTAT

Amperes	Volts	R P M
175	2-5	900
	3-7	1200
400	2-5	720
	4-8	1200
600	2-6	720
	4-8	900
800	2-6	720
	4-8	900
1200	2-6	600
	4-8	720
1600	2-6	550
	4-8	600
	5-10	720
	6-12	800
2000	2-6	550
	4-8	600
	5-10	720
	6-12	800
2500	3-6	475
	4-8	500
	5-10	600
	6-12	720
3500	3-6	425
	4-8	475
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	4-8	7½	1200	7½	1200
600	2-6	7½	720	7½	720
	4-8	10	900	10	900
800	2-6	10	720	10	720
	4-8	15	900	15	900
1200	2-6	15	600	15	600
	4-8	20	720	20	720
1600	2-6	20	600	20	600
	4-8	25	600	27	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	4-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	4-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	4-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	600
5000	3-8	75	450	75	450



115 230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty

From 1 H P to 100 H P

H P	R P M	Standard Pulley		
		Dia	Face	Bore
1	450	4	3	$1\frac{3}{16}$
	230	5	4	$1\frac{5}{16}$
2	875	4	4	$1\frac{3}{16}$
	400	5	4	$1\frac{5}{16}$
	240	5	4	$1\frac{5}{16}$
	220	6	5	$1\frac{7}{16}$
2.5	1000	5	3	$1\frac{3}{16}$
	475	5	4	$1\frac{5}{16}$
	475	5	4	$1\frac{5}{16}$
	250	6	6	$1\frac{7}{16}$
3	1350	5	3	$1\frac{3}{16}$
	550	6	4	$1\frac{5}{16}$
	430	6	4	$1\frac{5}{16}$
	285	7	5	$1\frac{7}{16}$
3.5	625	5	5	$1\frac{5}{16}$
	500	5	5	$1\frac{5}{16}$
4	375	8	5	$1\frac{7}{16}$
5	1000	5	5	$1\frac{5}{16}$
	750	6	5	$1\frac{5}{16}$
	400	8	5	$1\frac{7}{16}$
	300	9	6	$1\frac{7}{16}$
7.5	1800	5	4	$1\frac{5}{16}$
	1150	6	5	$1\frac{5}{16}$
	650	8	6	$1\frac{7}{16}$
	500	10	6	$1\frac{7}{16}$
	425	10	6	$1\frac{7}{16}$
10	1700	8	5	$1\frac{5}{16}$
	1000	8	5	$1\frac{7}{16}$
	750	8	6	$1\frac{7}{16}$
	600	8	6	$1\frac{7}{16}$
	400	10	8	$1\frac{15}{16}$
15	1350	7	6	$1\frac{7}{16}$
	1050	8	8	$1\frac{15}{16}$
	850	10	6	$1\frac{15}{16}$
	575	10	8	$1\frac{15}{16}$
	490	12	8	$1\frac{15}{16}$
20	800	10	8	$1\frac{15}{16}$
	525	12	8	$1\frac{15}{16}$
	325	16	10	$2\frac{3}{16}$
30	1200	10	8	$1\frac{15}{16}$
	1000	10	8	$1\frac{15}{16}$
	750	12	8	$2\frac{3}{16}$
35	850	12	10	$2\frac{3}{16}$
	625	12	10	$2\frac{3}{16}$
40	525	14	10	$2\frac{13}{16}$
50	675	14	12	$2\frac{13}{16}$
60	1000	14	12	$2\frac{13}{16}$
	435	20	16	$2\frac{13}{16}$
75	575	20	16	$2\frac{13}{16}$
100	800	20	18	$2\frac{13}{16}$

115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P to 15 H P

H. P	R. P. M	Efficiency		
		100%	75%	50%
5	1750	85	83	78.5
	1150	86	84.1	79.4
7½	1750	86.5	84.5	79.8
	1150	87	85	80
10	1750	87	85.2	80
	1150	87.2	85.3	80.5
15	1750	87.2	85.2	80.2
	1150	87.5	86	80.9
20	1750	88	86.4	80.6
	1150	88	86	81.3
25	1750	88.6	86.2	81.5
	1150	89	87.2	83
35	1750	89.3	87.8	83.3
	1150	89.7	88	84
40	1750	90	88.3	84.3
	1150	90.5	89.2	86.2
50	1750	91.	89.7	89
	1150	91	89.7	87
60	1750	91.2	90	87
	1150	91.3	90	87

THE KENNEDY VALVE MFG. CO.

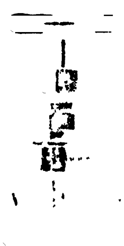
MAIN OFFICE AND WORKS
ELMIRA, N. Y.
BRANCHES AND WAREHOUSES
New York, 95 John St San Francisco, 23-25 Minna St Boston, 17 India St Chicago, 204-8 N Jefferson S
SALES OFFICES
Philadelphia, Continental Hotel Bldg Salt Lake City, Dooly Bldg Kansas City, Mutual Bldg El Paso, Two Republi
Seattle, L. C. Smith Bldg Portland, Ore. Railway Exchange Bldg Winnipeg, Chamber of Commerce Bldg
EXPORT OFFICE 95 JOHN STREET, NEW YORK

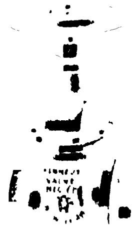
PRODUCTS

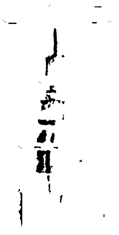
Gate, Globe, Angle, Check and other Valves for handling acid and alkaline chemicals, steam, water, air, gas, oil, etc. Fire hydrants, water gates, sprinkler valves for fire protection in industrial plants.

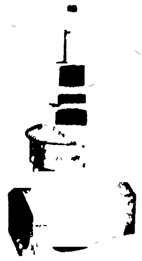
GUARANTEE

All Kennedy goods are thoroughly tested be leaving the works. Should any defects develop proper use of goods in the service for which they manufactured and sold, such goods will be repla









BRONZE GATE VALVES

Fig 27—Screwed "Standard"

Fig 30—Flanged "Standard"

Fig 37—Screwed "Medium Heavy"

Fig 40—Screwed "Extra Heavy"

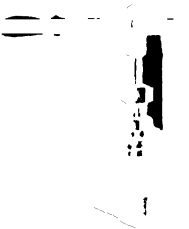


Fig 36—Quick Opening

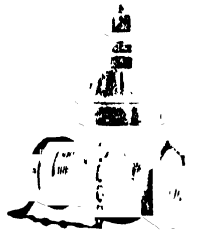
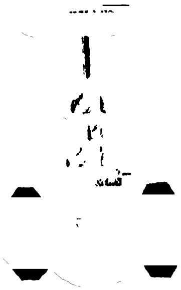
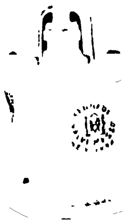


Fig 29—Hose Gate

BRONZE GLOBE VALVE

Fig 130—Regrinding Globe





IRON-BODY BRONZE-MOUNTED GLOBE AND ANGLE VALVES

Fig 91—Renewable Disc

Fig 100—Screwed "Heavy"

Fig 102—Flanged "Heavy" Angle

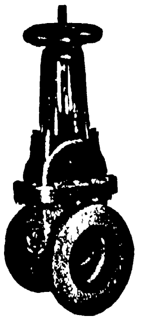
IRON-BODY BRONZE-MOUNTED GATE VALVES

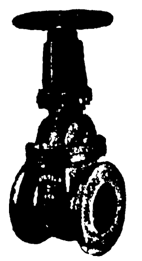
Fig 82—Screwed "Standard"

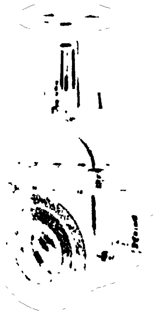
Fig 83—Flanged "Standard"

Fig 56—Bell End "Standard"

Fig 76—Flanged "Extra Heavy"







OUTSIDE-RISING STEM AND YOKE GATE VALVES

Fig 60—Screwed "Standard"

Fig 61—Flanged "Standard"

Fig 48—Flanged "Low Pressure"

Fig 68—"Underwriters Approved"

Fig 75E—Flanged "Medium Heavy"

Fig 771E—Flanged "Extra Heavy"

GATE VALVE

Fig 47—"Low Pressure"

CHECK VALVES

Fig. 103—Screwed Swing Check

Fig. 107—Bell-End Check

PENNIE BACKWATER VALVE

Fig. 55

WORKMANSHIP AND MATERIALS

All goods are made by expert workmen, by means of modern appliances in every department. All parts of valves are standardized and interchangeable, and every valve is thoroughly tested before shipment. All raw materials and castings produced are analyzed and tested daily during process of manufacture.

CATALOGS

Complete catalogs in either large or pocket size will be sent on application.

KENT MACHINE WORKS, INC.

37 to 41 Gold Street, 251 and 256 Plymouth Street
BROOKLYN, N. Y.

PRODUCTS

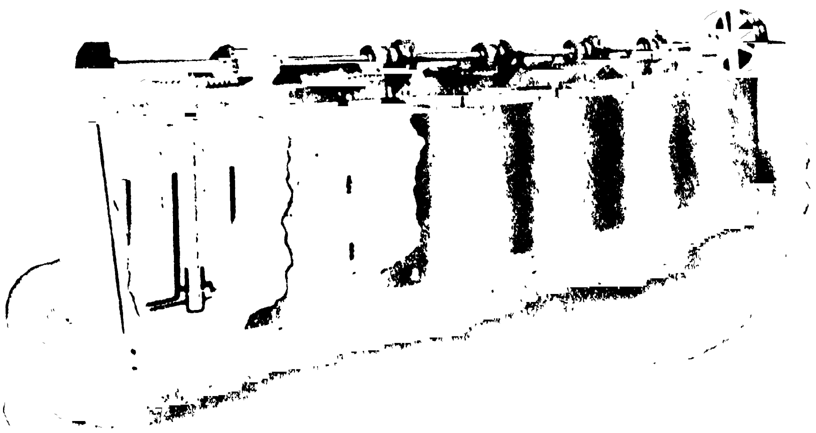
- Roller **Mills**
- Lead **Mills**
- Lead **Mixers**
- Color **Mixers**
- Dry **Mills**
- Pulverizers
- Liquid **Mixers**
- Liquid **Mills**

SCOPE

We manufacture a full line of machinery for the **paint** and **ink** industries

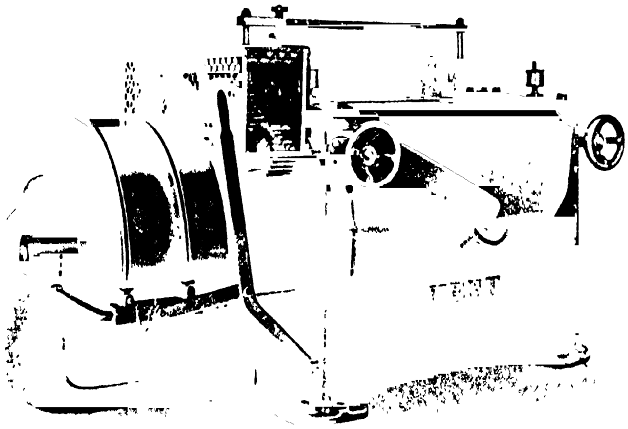
CATALOG

Send for a copy of our latest catalog.



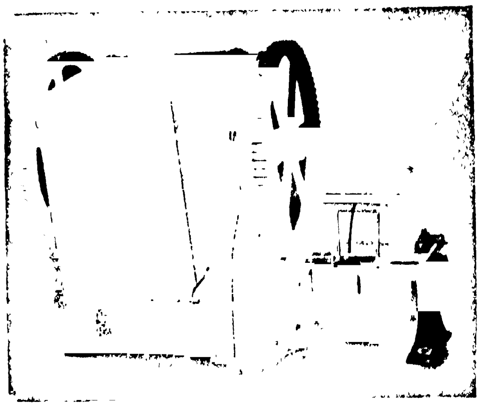
No 28 A

LIQUID AND SEMI PASTE MIXERS
60 to 300 gallons capacity



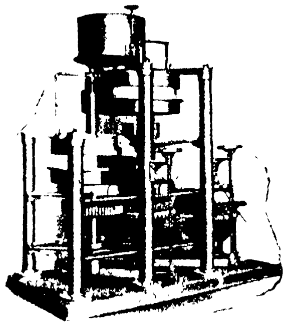
Nos. 59 and 59-A

CHILLED ROLLER MILLS
Water cooled or steam heated
6" x 14", 9" x 24", 12" x 30", 16" x 40"



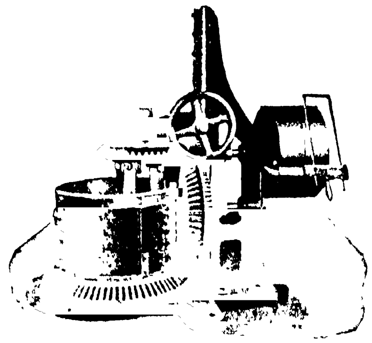
No 57

MIXER WITH MACHINE CUT GEARS



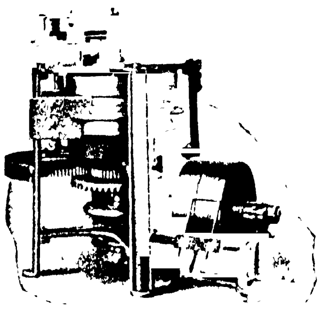
No. 50

TANDEM MILLS
20 22, 26 and 30 inches diameter



No. 23-B

PONY MIXERS
Various sizes



No. 22-A

WATER COOLED FINE COLOR MILLS

KENT MILL COMPANY

Manufacturers of

Pulverizing, Crushing and Screening Machinery
Mining Fertilizer and Cement Machinery

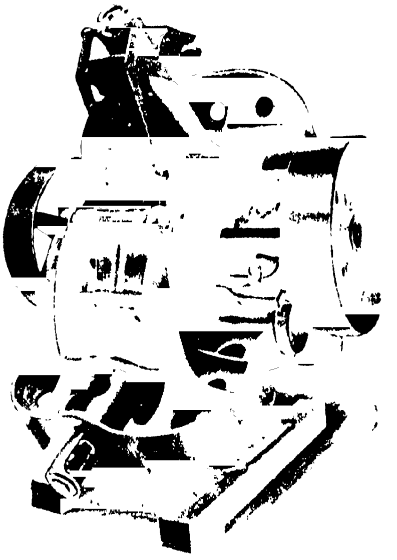
10 RAPELYE STREET, BROOKLYN, N. Y.

PRODUCTS

Pulverizing, Crushing and Screening Machinery. Mining Fertilizer and Cement Machinery.

MAXECON MILL

A pulverizer constructed and operated on the principle of a free vertical concave ring yieldingly supported on three rolls pressing against its inner face. The ring revolves, so that material fed on its inner face is held there by centrifugal force, revolves with the ring and passes under the rolls which are held up to the work by heavy springs. The rolls crush the material against the ring and discharge it through the bottom of the mill. The ring and three rolls are the wearing parts.

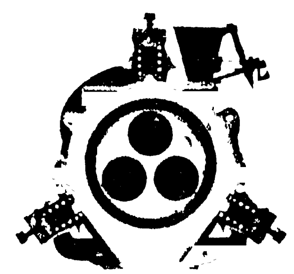


MAXECON MILL

Feed—Grinds hard or soft friable material from 2″ down.

Output—From 1 to 20 tons per hour, according to size of mill, kind and hardness of material.

Fineness—From ¼″ to 200 mesh.



CROSS-SECTION OF MAXECON MILL

Adaptability—The Maxecon Mill has proved itself especially advantageous in many branches of the Chemical Industry.

Some of the materials it grinds are as follows:

Coal, Coke, Bauxite	for	Aluminum
Ivory Nuts	"	Lactic Acid
Iron Borings	"	Waterproof Compounds
Limestone	"	Cement and Fertilizer
Cement Clinker	"	Cement
Calcined Magnesite	"	Refractory Bricks, Linings, etc. "
Phosphate Rock	"	Fertilizer, Phosphoric Acid
Ores of Various Kinds	"	Preparation for treatment
Quartz, Traprock, etc.	"	Road Surfacing

Power—Varies with work, but customers report saving of 50% to 80% over other pulverizers.

Repairs—Vary with abrasiveness of material ground, but again customers report savings from 50% to 80%.

A FEW OF OUR CUSTOMERS

Virginia-Carolina Chem Co (21 plants)

U S Steel Corporation

Cayuga Portland Cement Co

Southern Agri Chem Corp

Harbison-Walker Mfg Co

Aluminum Ore Co

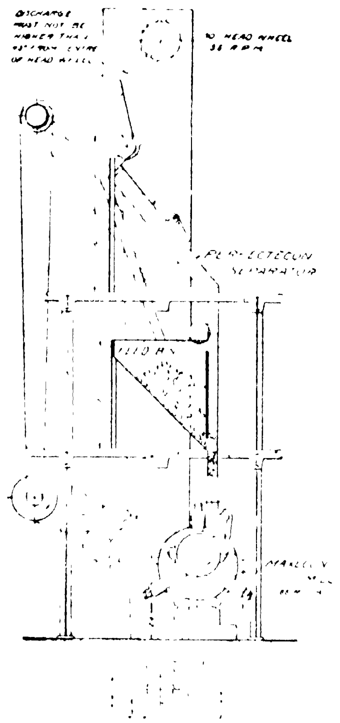
F S Royster Guano Co

Amer Refractories Co

U. S Aluminum Co

Ammo Phos Corporation

Our **American Air Separator** is best for all products finer than 80 mesh.

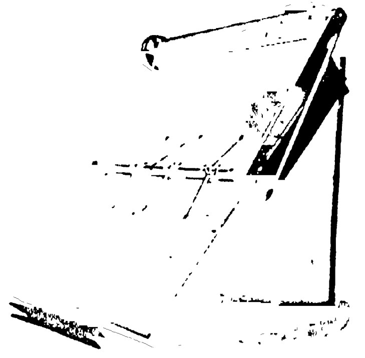


A COMPLETE MAXECON MILL INSTALLATION

Maxecon Mill, Perfectecon Separator, and Elevator taking feed 2″ and finer and grinding and screening a product down to 80 mesh fineness

PERFECTECON SEPARATOR, Best for coarse

An inclined screen of the vibrating type having a distributing conveyor, a scalper to save the fine cloth Three screen frames arranged step fashion one above the other, with a dam to check flow of material from one frame to the next, allowing material to pass over screens slowly, assuring maximum output. Screen surface positively vibrated by cam actuated hammers and knockers. All steel construction to assure longest life.



PERFECTECON SEPARATOR

KEWAUNEE MANUFACTURING COMPANY

Laboratory Furniture Experts

KEWAUNEE, WISCONSIN

PRODUCTS:

Laboratory Furniture for Commercial Laboratories, Industrial Plants, Educational Institutions, Hospitals, etc., consisting of Physics, Chemistry, Biology, Agricultural, Electrical, Physiography and General Laboratory Furniture; also Domestic Science and Domestic Art, Drafting-Room, Manual Training and Kindergarten Furniture.

FACILITIES:

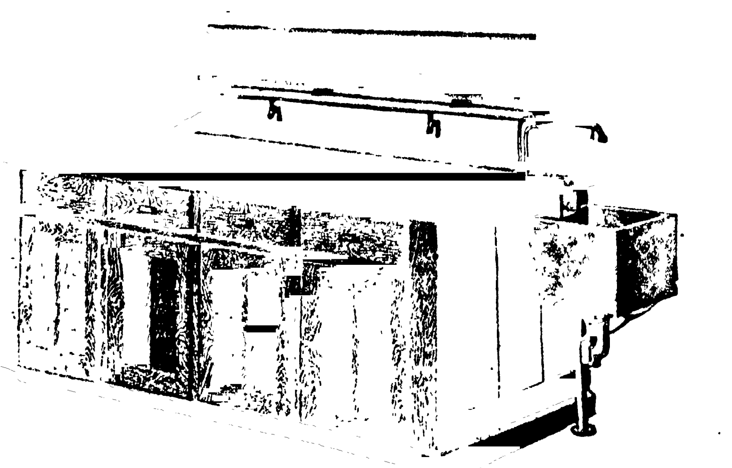
The correct manufacture of modern laboratory furniture requires an exactness and special attention to detail that cannot be performed by untrained or inexperienced workmen. Our years of experience devoted exclusively to the production of laboratory furniture, our complete factory equipment of modern cabinet-making machinery, with skilled cabinet-makers trained in this special work, our extensive floor space and vast dry kiln and tempering-room capacity, enable us to extend intelligent service and to supply laboratory furniture of the very best type of construction, of quality and of adaptability.

CONSTRUCTION:

The quality and stability of Kewaunee tops has always been conceded to be without equal. We developed and perfected what is known as our Automatic Take-up for Table Tops. This invention consists of a steel rod set in the top, and at each end of this rod is placed a washer, then a heavy compression spring, another washer and a nut. The springs are gauged to resist in equal measure, the expansive force of birch. If the top should swell slightly, the springs instantly retard that action with heavy pressure, yet do not crush the joints or break the glue like the plain bolt. It is natural then, when the wood shrinks back to normal, the springs reciprocate and assist the action and that they have taken almost all the strain off the glued joints. The careful curing of the heavy birch for our table tops, with this additional safeguard against possible trouble under severe changes in humidity, and the successful "Kewaunee" carbonized black acid-proof finish on the working surface, gives to the scientist a table top that is supreme in every test of materials or products for this laboratory purpose.

BLUE PRINTS:

Blue prints, showing locations of floor connections, will be sent on request to prospective customers. We will make drawings gratis, upon receipt of specifications.



CHEMISTRY DESK FOR RESEARCH AND ANALYSIS

KESTNER EVAPORATOR COMPANY

18th Street and Allegheny Avenue

PHILADELPHIA, PA.

London
5 Grosvenor Gardens, Westminster

Lille
7 Rue de Toul

PRODUCTS:

Evaporators Single and Multiple, Vacuum and Pressure, Fireheated, Salting

Spray Dryers Liquids to Powder

Heaters, High Speed, multipass

Filters

Chemical and Engineering Problems in connection with Evaporation and Filtration.

GENERAL:

Kestners are evaporating today more than 55,000,000 pounds of water per hour.

They have handled their share of war work and are now prepared to take up the new problems of peace.

For many years in fact, since Kestners were first put on the market they have been in the advance in the evaporating field all over the world. Many competitors have attempted to imitate our special features, but none have been successful in accomplishing our results.

In Double Effect we evaporate 2.05 lbs. of water per lb. of steam used.

In Triple Effect we evaporate 3.15 lbs. of water per lb. of steam used.

In Quadruple Effect we evaporate 4.20 lbs. of water per lb. of steam used.

In Quadruple Effect with 5 lbs. steam pressure doing 80% evaporation and *including the pre-heating* of the liquid from 70° F. we evaporate 3 lbs. of water per lb. of steam used.

We build special types for special work and make a careful study of each separate problem.

FEATURES:

Among the special features of the Kestner are:

Time--The entire evaporation in a Kestner takes place in seconds as compared with hours in other types. Thus, in a Triple Effect the liquid is in contact with the heating surface about 30 seconds in each body, or 6 minutes elapse from the time the liquid enters the first body until it is discharged from the last body, fully concentrated. Sensitive materials, as gelatin, glue, wood extracts, etc., are not injured as to flavor or color.

Greater Evaporation per pound of steam. 15% more than our competitors in most cases and 50% more in many.

No Entrainment, even on the most foaming liquids, due to our special separator. Those who have handled foamy liquids on other type evaporators during the war will appreciate the saving this means.

Gas Extraction 100% at all times. This means 100% use of the heating surface.

No Volume of Liquid in Transit. The Kestner starts the minute the liquid reaches the evaporation station, is discharging within a few minutes and can be shut down almost as soon as the last liquid reaches it.

Scaling much less than in other types and generally entirely eliminated, saving time, labor and chemicals.

Low Cost of Upkeep. Few joints. No float valves and other automatic controls. Pumps reduced to a minimum.

High in First Cost as every high-grade machine must be. The savings shown in many cases soon pay the *entire* cost of the installation.

Continued on Next Page

TYPES:

I Kestner Climbing Film Evaporators for general work under pressure and vacuum, in Single or Multiple Effect, with and without side heatings Type "CF"

II Kestner Pre-Evaporators for work under high pressure, producing supplementary steam for use in heating and evaporating Type "P"

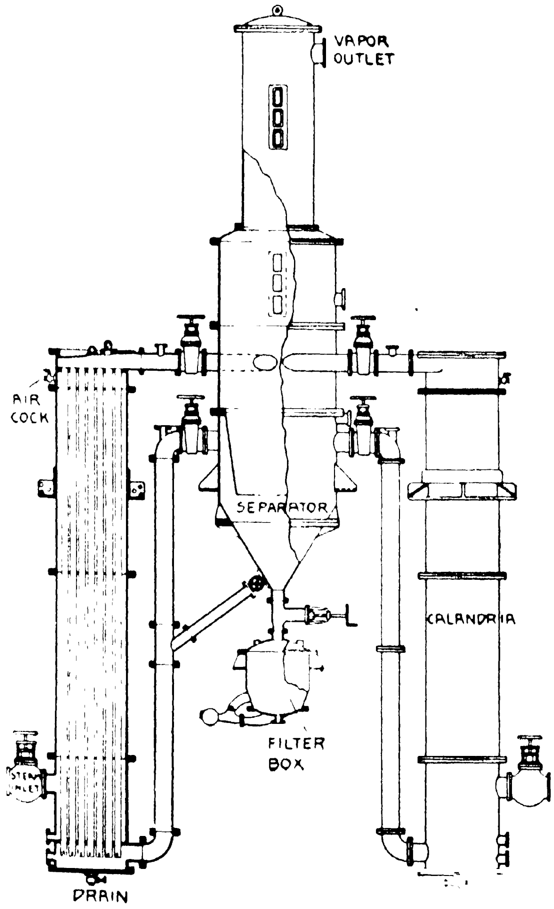
III Kestner Falling Film Evaporators where high percentage evaporation is required in Single Effect and short time contact between the liquid and heating surface. Either vacuum or pressure Type "FF"

IV Kestner Serpentine Evaporators for dry extracts Type "S"

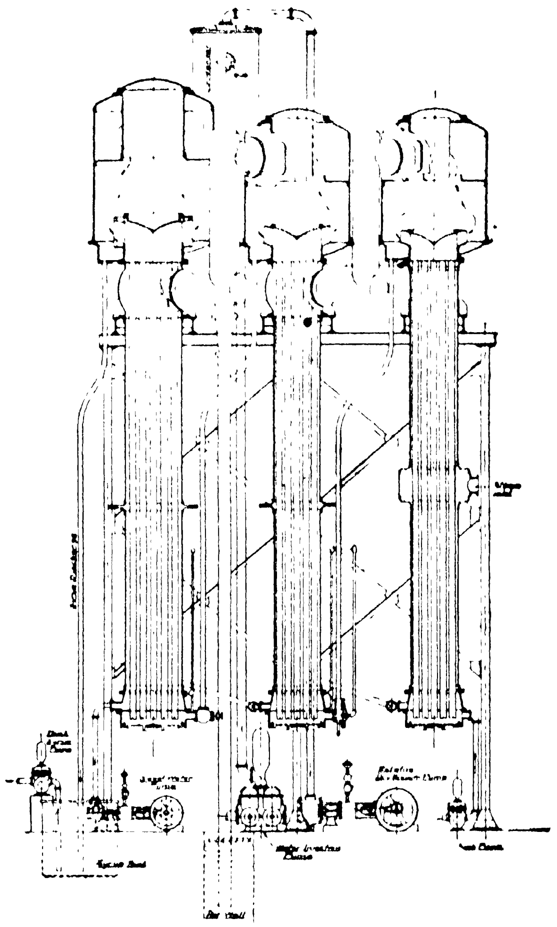
V Kestner Echangeur Evaporators for corrosive liquors . . Type "E"

VI Kestner Fire Heated Evaporators Type "F"

VII Kestner Salting Pans, Single or Multiple, vacuum or pressure, embodying all the special features of the Kestner types . . Type "SP"



SALTING PAN



SECTIONAL DETAILS, TRIPLE EFFECT EVAPORATOR

VIII **Additional Heating Surface** to existing apparatus Not only increases the capacity at start, but because it tends to keep clean the old heating system while not fouling the new, maintains capacity

SPRAY DRYERS

I A closed plant drying in a medium of superheated steam, entirely eliminating the danger of fire and explosion
Handles the most sensitive materials

II A semi-closed system drying in a medium of air where low temperatures are a necessity.
No loss of product.
Low cost of production
Upkeep charges practically eliminated.

KEYSTONE DRILLER COMPANY

TRADE MARK
DOWNIE
REGISTERED U S PATENT OFFICE

Manufacturers of "Downie"
Deep Well and Centrifugal Pumps
BEAVER FALLS, PA

Cable Address
"DRILLER", Beaver Falls, Pa
BRANCH OFFICES
170 Broadway New York
Monadnock Block Chicago
Joplin, Mo

PRODUCTS

"Downie" deep well plunger pumps, single and double stroke, steam and geared. Described in Catalog No. 6.

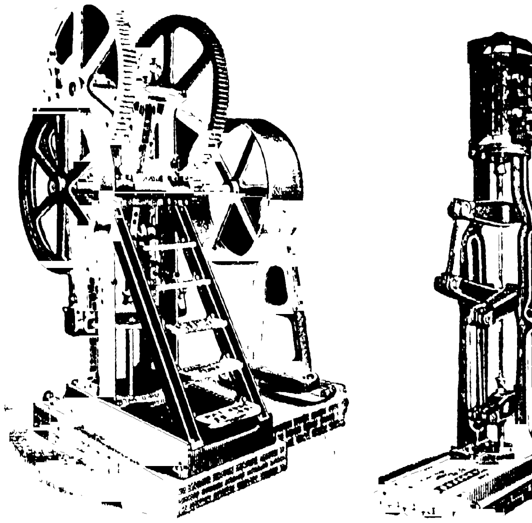
"Downie" Centrifugal Pumps, single and multi stage, horizontal and vertical. Described in Bulletin No. 801.

"DOWNIE" DEEP WELL PUMPS

These pumps are built in a large variety of types and sizes to meet every deep well pumping condition where steam or any form of driving power is available Capacities ranging from 85,000 gals per hour using 18" dia. Working Barrel, down to 250 to 600 gals. per hour using 1¾" dia Working Barrel They are designed and constructed according to the highest standards of engineering practice, incorporating only accepted scientific principles of operation, and to obtain the highest degree of efficient, reliable and satisfactory operation with minimum cost of maintenance. The power heads can be furnished with any form of drive, belt, rope, chain, gear, or direct drive, from any type of driver

"Downie" Single Stroke Deep Well Pumps, Steam and Geared—Are suitable for pumping moderate quantities of water from a given size well, and where power economy is not so important as it is to keep the initial cost of equipment at a minimum for reliable operation. Guaranteed efficiency on "Downie" Single Stroke Pumps over 55%.

"Downie" Double Stroke Deep Well Pumps, Steam and Geared—Should be used where a maximum quantity of water is wanted from a given size well, and where the highest possible degree of power economy is desired. These pumps produce an absolute steady flow of water at the pump discharge Guaranteed efficiency on "Downie" Double Stroke Pumps—over 80%

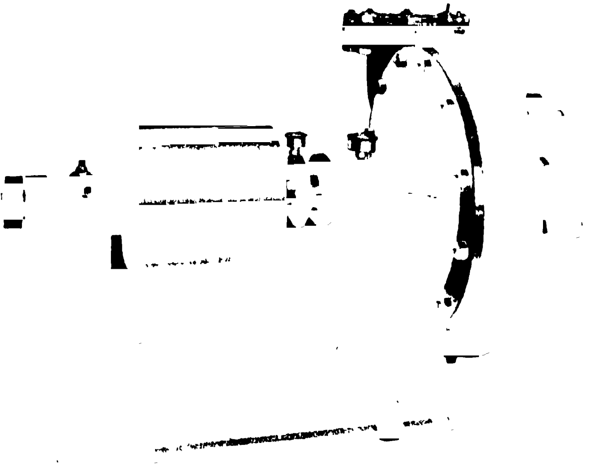


Geared Type Steam Type

"DOWNIE" DOUBLE STROKE DEEP WELL PUMPS

"DOWNIE" CENTRIFUGAL PUMPS

These pumps include a large variety of types and sizes from 1" to 15" inclusive for capacities ranging from 15 to 10,000 gals. per minute, and to operate against total heads up to 500 ft or 215 lbs pressure They are particularly noted for their ruggedness, simplicity, and exceptionally high degree of economical operation. They can be furnished with any form of drive, belt, rope, chain, gear, or direct drive, from any type of driver. Guaranteed efficiency on "Downie" Centrifugal Pumps—50% to 80%, varying according to size and operating conditions.



"DOWNIE" CENTRIFUGAL PUMP, BELTED TYPE

ENGINEERING SERVICE

An Engineering Service Department is maintained by the **Keystone Driller Co.** which is especially prepared to assist in the selection of equipment to fulfil any condition of requirements in the most economical, reliable and satisfactory manner. Those contemplating the installation of deep well pumping equipment are invited to present their problems. This service is free and carries no obligation. In presenting these problems, if the following information is given, as far as possible, in first communication, it will save time and correspondence

1 Quantity it is desired to pump, per minute, per hour, or per day of so many hours 2 Pumping depth below ground surface (or mouth of well) when pumping the desired quantity Note: If unable to give No 2, state, if possible, the natural standing depth of water below ground surface, and how much it lowered when pumping any given quantity, stating quantity. 3 Vertical lift required above surface (if any), or pressure per sq inch, into pressure tanks or mains. 4. Dia of well, down to where it is likely necessary to set Working Barrel, also state total depth of well. 5. State kind of power available and form of drive preferred. Also whether driving power is to be included with pump, and if electric, state voltage if direct current, and cycles phase and voltage if alternating current.

THE KIER FIRE BRICK COMPANY

Manufacturers of

Fire Clay Brick and Silica Brick

OLIVER BLDG., PITTSBURGH, PA.

ESTABLISHED 1845
The Kier Fire Brick Co
PITTSBURGH, PA.

PRODUCTS

Fire Clay Brick ("Salina")
Silica Brick ("Lyon")
("Yough")
Fire Clays
Ganister

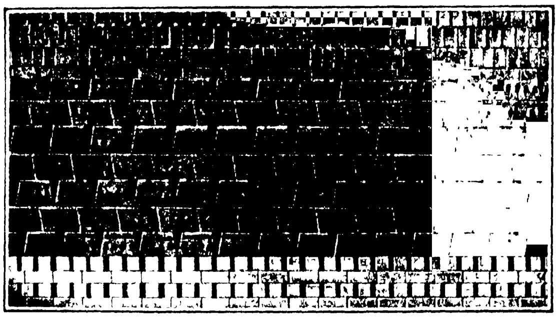
FACILITIES

We have large modern kilns, drying floors, and other facilities for production of fire brick in any quantity. We have been 75 years developing our business to its present state. Our experience is at the service of our customers at all times.

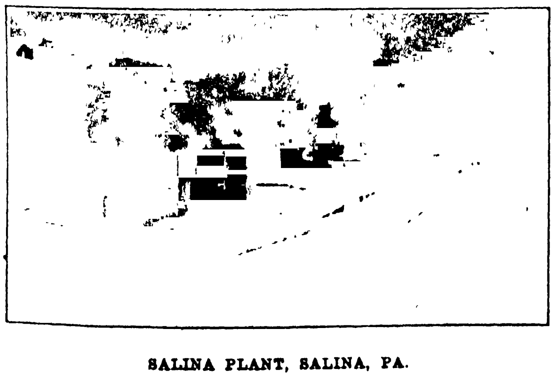
STANDARD SHAPES

Modern business practice has accepted standardization as one of its most important principles.

Great progress is yearly being made in the refractories industry. We aim to enlist the user of fire clay and silica shapes in the ranks of those who, believing that unnecessary labor and unnecessary expenditures are economic wastes, are doing their part to reduce these wastes to the lowest possible point.



STANDARD SILICA BRICK SHAPES



SALINA PLANT, SALINA, PA.

GANISTER

We are headquarters for Ganister, having our own quarries located in Pennsylvania with unlimited production facilities.

SILICA BRICK ("Lyon")

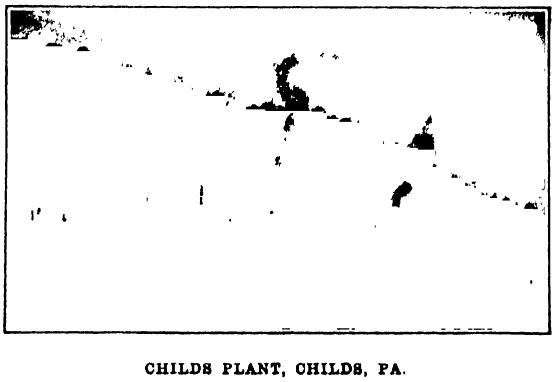
One of our specialties is Silica Brick. Our methods of drying, burning, and cooling give a high temperature perfectly bonded brick with uniform expansion. They are the best brick for use where constant high temperatures are employed. Silica Brick should not be used for furnace settings where high temperatures are reached in a comparatively short period of time and then rapidly cooled off again. For these conditions we recommend our Fire-Clay Brick.

FIRE-CLAY BRICK ("Salina")

This product, made of the best Pennsylvania clays, has been perfected for all severe conditions of temperature change. It has a number of applications in the chemical plants where a great deal of heating by direct fire is necessary, such as in furnace settings for heating autoclaves, evaporating pans, stills, digesters, etc. Our standard shapes can be used to fit any desired furnace setting.

YOUGH BRAND SILICA

Our Yough Brand is a high grade special Silica Brick developed by us for heating furnaces where heat conditions are too severe for clay brick and variations in temperature are too great for regular Silica Brick.



CHILDS PLANT, CHILDS, PA.

THE KILBY MANUFACTURING COMPANY

Sugar Machinery
And all classes of Heavy Machinery and Foundry Work
MAIN OFFICE AND WORKS
1623 LAKESIDE AVE., CLEVELAND, OHIO

PRODUCTS

- Chemical Equipment to buyers' designs and specifications
- Garbage Disposal Machinery
- Pulp Drying Plants
- Gray Iron and Semi-Steel Castings of every description, rough or machined
- Glucose Machinery
- Sugar Machinery
  - Beet Wheels
  - Beet Washers
  - Beet Roller Conveyors
  - Cossette Transporters
  - Beet Cutters
  - Diffusion Batteries
  - Carbonation Stations
  - Filter Presses
  - Sulphur Stations
  - Condensers
- Evaporators
  - "Standard"
  - "Wellner-Jelinek"
  - "Pre-Evaporators"
- Heaters
- Vacuum Pans
  - Coil
  - Calandria
- Crystallizers
- Lime Kilns
- Lime Slackers
- Lime Agitators
- Gas Washers
- Steffen Process Machinery
- Pulp Dryers
- Char Filters
- Char Kilns
- Char Dryers
- Retorts
- Tanks, etc.

SPECIALTIES

Sugar Machinery for Beet and Cane Sugar Factories and Refineries.

Evaporators for all purposes—Sugar, Salt, Chemical Products, etc.

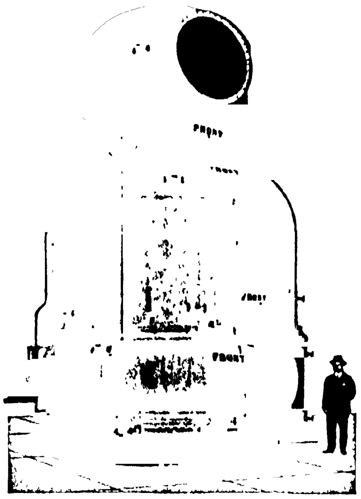
CAST IRON STEAM BELT
Weight 30000 lb Cast in One Piece and Split

CAST IRON CASTING
Weight 44000 lb

MANUFACTURING FACILITIES

Modern Machine, Pattern and Tank Shops a Gray Iron and Semi-Steel Foundry.

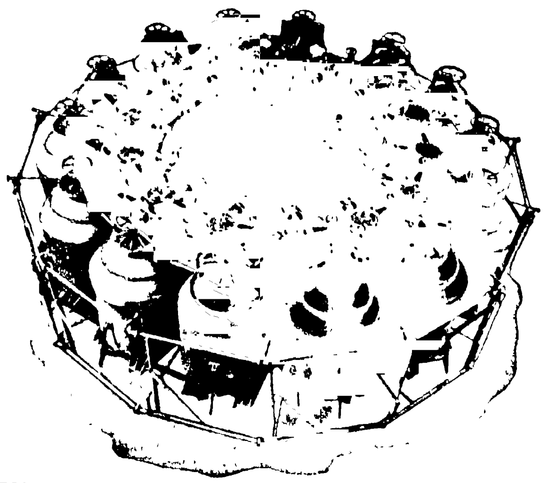
Our Plant is equipped to make and machine the largest castings required in the construction of modern evaporators and other heavy machinery.



14' 0" CALANDRIA VACUUM PAN

We have drawings and patterns of all kinds of Sugar Making Machinery and our experience, engineering and manufacturing facilities are of the best.

We are also fully equipped for manufacturing all classes of machinery to engineers' specifications and blueprints.



TOP VIEW OF A 14 CELL CIRCULAR DIFFUSION BATTERY

THE KIER FIRE BRICK COMPANY

Manufacturers of

Fire Clay Brick and Silica Brick

OLIVER BLDG., PITTSBURGH, PA.

ESTABLISHED 1845
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("Yough")
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Ganister

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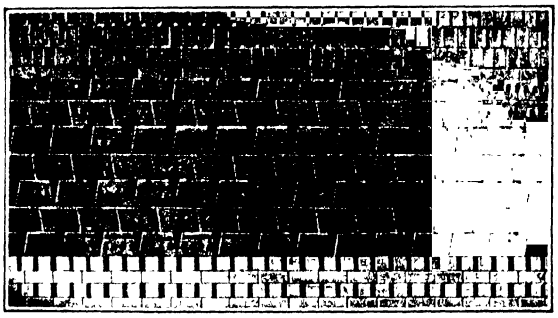
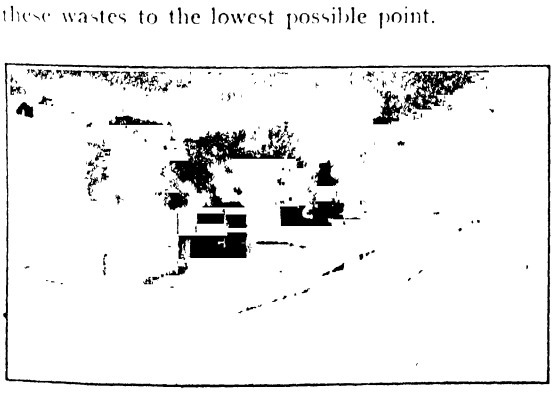


STANDARD SILICA BRICK SHAPES



SALINA PLANT, SALINA, PA.

GANISTER

We are headquarters for Ganister, having our own quarries located in Pennsylvania with unlimited production facilities.

SILICA BRICK ("Lyon")

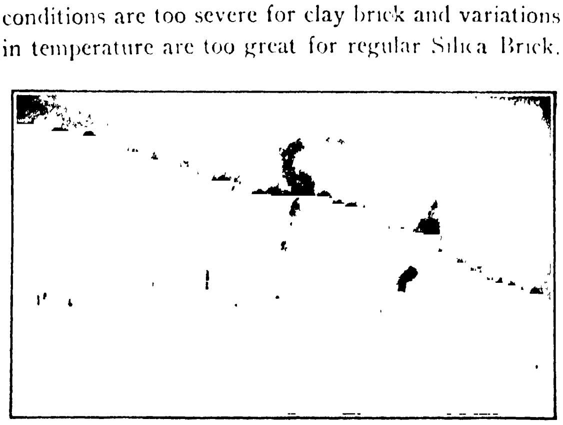
One of our specialties is Silica Brick. Our methods of drying, burning, and cooling give a high temperature perfectly bonded brick with uniform expansion. They are the best brick for use where constant high temperatures are employed. Silica Brick should not be used for furnace settings where high temperatures are reached in a comparatively short period of time and then rapidly cooled off again. For these conditions we recommend our Fire-Clay Brick.

FIRE-CLAY BRICK ("Salina")

This product, made of the best Pennsylvania clays, has been perfected for all severe conditions of temperature change. It has a number of applications in the chemical plants where a great deal of heating by direct fire is necessary, such as in furnace settings for heating autoclaves, evaporating pans, stills, digesters, etc. Our standard shapes can be used to fit any desired furnace setting.

YOUGH BRAND SILICA

Our Yough Brand is a high grade special Silica Brick developed by us for heating furnaces where heat conditions are too severe for clay brick and variations in temperature are too great for regular Silica Brick.



CHILDS PLANT, CHILDS, PA.

MAURICE A. KNIGHT

Manufacturer of

Acid Proof Chemical Stoneware, Acid Brick,
Special Ware and Pipe

OFFICE AND FACTORY
KELLY AVENUE, EAST AKRON, OHIO

TRADE MARK

TRADE MARK

PRODUCTS (PARTIAL LIST)

- Acid Eggs, Chemical Stoneware
- Acid Proof Chemical Stoneware
- Arsenic Acid Plants
- Brick, acid proof
- Balls, hollow acid proof stoneware
- Blowcases, acid proof stoneware
- Covers, acid proof stoneware
- Cocks, acid proof stoneware
- Check Valves, acid proof stoneware
- Carboy Stoppers, hard or porous, stoneware, acid proof
- Cement, acid proof
- Chemical Stoneware, acid proof
- Coils or worms, stoneware, acid proof
- Dipping Baskets, acid proof stoneware
- Distributors, open type tower, acid proof stoneware
- Distributors, closed type tower, acid proof stoneware
- Evaporating Pans or Dishes, acid proof stoneware
- Ejectors, acid proof stoneware
- Funnels, acid proof stoneware
- Faucets or Spigots, acid proof stoneware
- Filters, suction, acid proof stoneware
- Injectors, acid proof stoneware
- Jars, storage, acid proof stoneware
- Jars, acid proof stoneware
- Jets, steam, acid proof stoneware
- Kettles, acid proof stoneware
- Muriatic Acid Plants, acid proof stoneware
- Manifolds, acid proof stoneware
- Nitric Acid Plants, acid proof stoneware
- Pipe and Fittings, acid proof stoneware
- Pots, stoneware, acid proof
- Pitchers, acid proof stoneware
- Radial Tile, acid proof stoneware
- Return Bends, acid proof stoneware
- Rolls, wire, acid proof stoneware
- Receivers, stoneware, acid proof
- Storage vessels, acid proof stoneware
- "S" Pipe, acid proof stoneware
- Sinks and Traps, laboratory, acid proof
- Stirrers or agitators, stoneware, acid proof
- Sulphuric Acid Towers, acid proof stoneware
- Stoneware, chemical, acid proof
- Tanks or vats, stoneware, acid proof
- Tile, floor or lining, acid proof
- Tourills, cellarius, stoneware, acid proof
- Towers, condensing or absorbing, acid proof, stoneware
- Tower packing or filling, stoneware, acid proof
- Tile, digestor lining, acid proof stoneware
- Tower lining, acid proof stoneware
- Tile, Radial, acid proof stoneware
- Valves or cocks, stoneware, acid proof
- Wire Rolls, acid proof stoneware

THE KNIGHT LINE

The Knight line of Chemical Stoneware includes every description of Chemical and Acid Proof Stoneware Apparatus, either standard or special. Whatever is your need in this direction we can supply it—with **the Stoneware that is acid proof throughout the entire body.**

KINDLY NOTE

That the types shown illustrate the more common forms of Chemical Stoneware we manufacture.

That they can be modified or changed to suit your requirements.

That we can make Chemical Stoneware to your order from your blueprints or sketches no matter how complex.

That our ware is not the cheapest nor is it fancy, is fully guaranteed to be Acid Proof throughout the entire body; free from such defects as checks, cracks or blisters; will not leak or sweat, and is satisfactory in every respect.

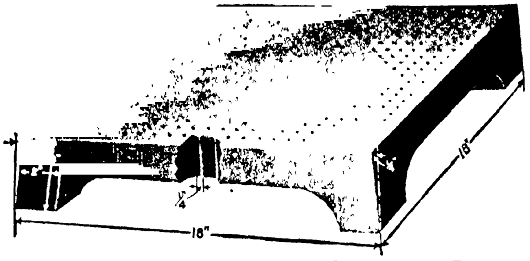


FIG. 140, ACID PROOF DRAINER OR BLOW PIT TILE

Made in four standard sizes
18" x 18" x 4" (shown above)
12" x 18" x 4"
12" x 12" x 3"
12" x 6" x 3"

Also used as filter tile for large tank filters. Made flat without corner lugs

Continued on Next Page

OPEN DISTRIBUTOR TYPE ACID TOWER

sed where a finely divided flow of liquid is not re- ed, or in condensation work, when distributor plate be omitted. Parts shown, reading from bottom are:

1 Cascade or saucer bottom.
2 Bottom ring section with Y gas inlet
3 Plain intermediate tower section.
4 Intermediate ring section with perforated support ate
5 Ring section with open type distributor plate and th cover, with socket gas outlet.
6 Return bend or goose neck with socket pipe

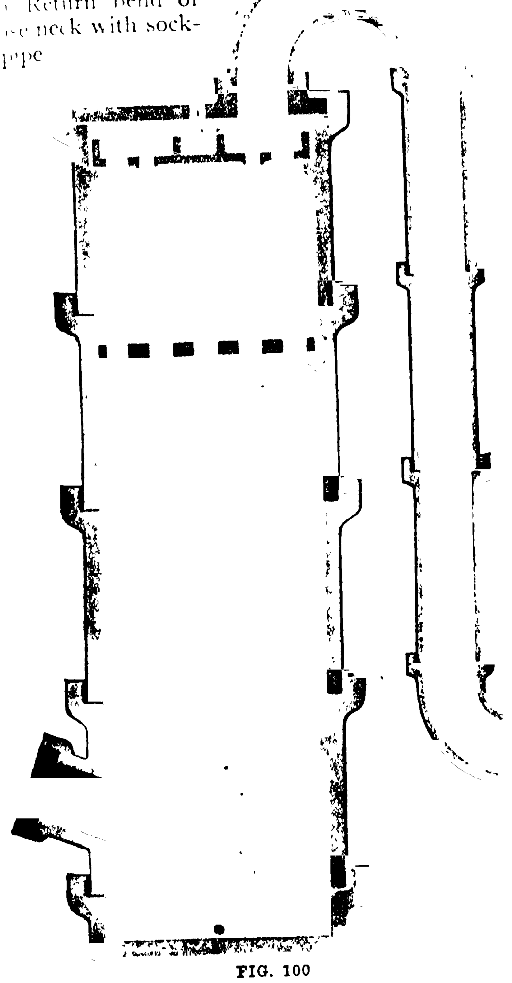


FIG. 100

Made in all sizes and designs, with all kinds of packing and fittings from 12 inch to 12 inch bores Sections interchangeable with Fig 101.

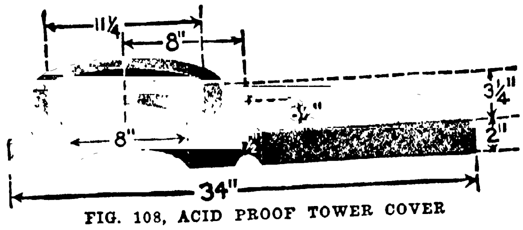


FIG. 108, ACID PROOF TOWER COVER

Used with internal distributing plate and doing away with Y or Tee outlet top section. Used with open type distributor, made in any size or bore tower from 12-in. to 42-in. above size for 30-in. bore tower.

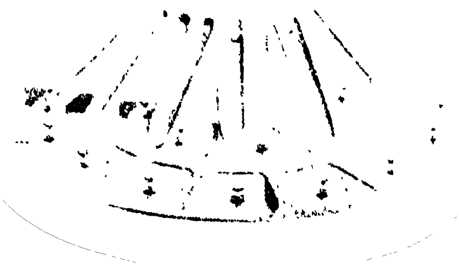


FIG. 110, CLOSED TYPE ACID PROOF TOWER DISTRIBUTOR, ASSEMBLED

Made to fit any size or bore tower from 12-in. up to 42 in

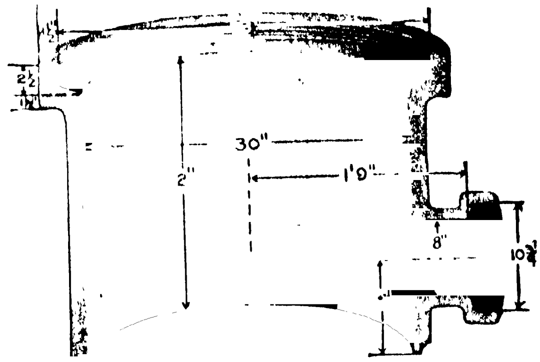


FIG. 127, ACID PROOF TOWER TOP OR BOTTOM SECTION

Or can be used as inlet bottom section by using cascade Made in any bore from 12 in up to 48 in.

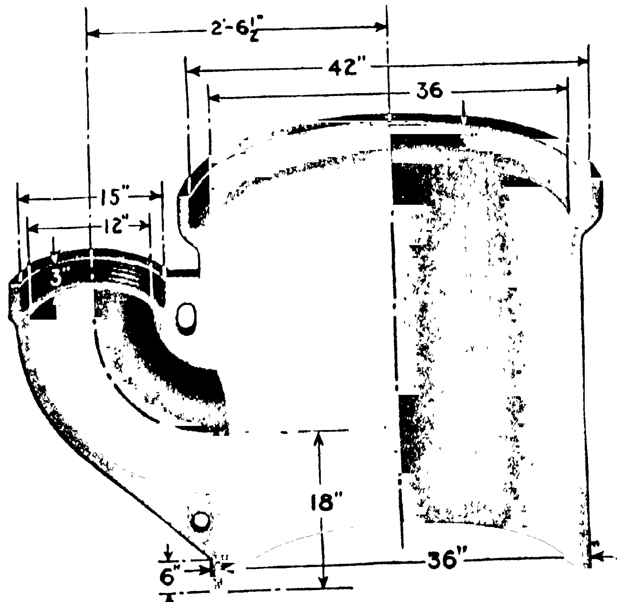


FIG. 120, STANDARD 36" TOWER BOTTOM SECTION

With 90°, 12" gas inlet Used with Cascade or Saucer bottom Same design used in other size towers. Can also be used as top tower section and gas outlet.

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Our Motto Service and honesty in deliveries.

We do not give a promise of quick delivery to procure your order, then disappoint you

Made in America by Americans who know how.

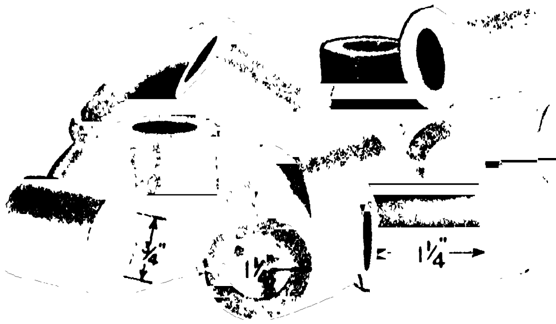

FIG. 135, SMALL TUBE TOWER PACKING

Used at top of towers over larger packing such as brick and rings to give better distribution of liquor over tower. Also as entire filling for small bore towers. Carried in stock.

FIG. 136, LARGE ACID PROOF TOWER BASE TILE

Used for bridge work at bottom of large sulfuric acid towers for supporting packing. Made in any sizes up to 60 in. by 36 in. by 6 in.

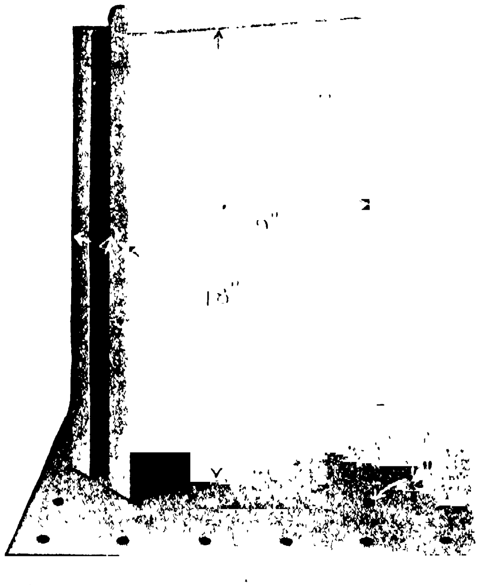

FIG. 138, ACID PROOF TONGUED AND GROOVED TILE

Used for building large tanks or filters. Made in most any size or radius with any size perforations.

A Stoneware that is Acid Proof and Vitrified all through

Our Ware is not dependent upon a Glaze, Enamel or Veneer.

It is the body itself.

Withstands the action of Acids, Alkalis and Che cals, strong or weak, hot or cold.

Our entire organization has been making acid pr Chemical Stoneware for over 15 years, and our pre enlarged activities include the making of **Every De scription** of acid proof Chemical Stoneware, fr small pieces to complete plants.

KNIGHT ACID BRICK

The brick that is made under 2-Ton pressure

The brick is made of 3 different clays

The vitrified brick that is Salt glazed. Tha **Knight** Acid Brick.

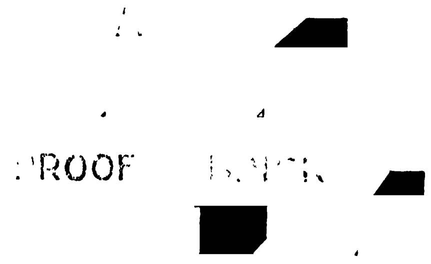

FIG. 130, ACID PROOF VITRIFIED BRICK

Made in most any size or shape. Standard size 8 in. by 4 in. by 2¼ in. carried in stock with No. 1 and No. 2 arch. Used for packing and lining Glover or Gay Lussac Towers or large Storage, or Galvanizing, or Pickling Tanks.

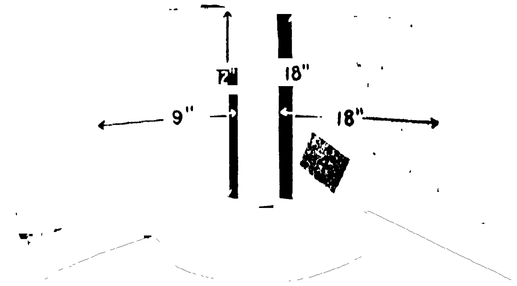

FIG. 137, ACID PROOF RADIAL TILE

Made in any size or radius for building towers or tanks

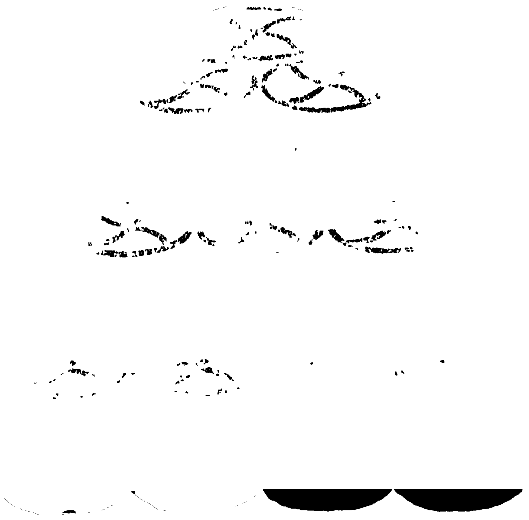

FIG. 132, ACID PROOF PARTITION RINGS

The most popular tower packing for any kind or size tower. Note the curved partitions. These rings afford a good draft and a maximum scrubbing surface. Made in three standard sizes—4-in. by 3-in., 6 in. by 4 in., 6 in. by 6-in.—carried in stock.

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ILLUSTRATING TYPES OF PIPE AND FITTINGS

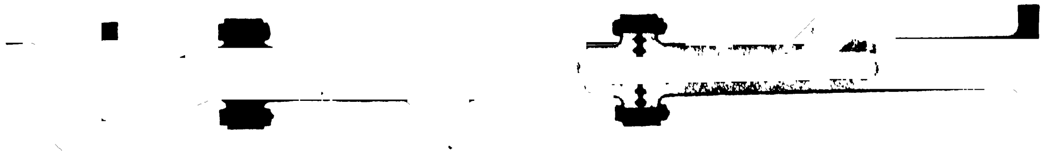

FIG. 240, ACID PROOF GROUND AND GROOVED BOLT HOLE FLANGED PIPE

p'' trap straight "T" and sanitary "T" fittings style of pipe is bolted together with asbestos wicking placed in . Made in any bore up to 6 inches and in all kinds of fittings for waste lines in buildings and other purposes

sed for pressure lines (up to 40 lbs per sq in) or in hori al open work for drainage Flanges are of same type as steel or pipe except are with slotted bolt holes Asbestos wicking soaked altum used in the grooves shown on flange in cut

FIG. 280, ACID PROOF CONICAL FLANGED PIPE LINE AND FITTINGS

Used on pump or pulsometer lines, and for other purposes, showing straight length, stopcock 90° elbow and return bend

Used on pump or "blow case" lines Requires gasket and special iron taper collars Not quite as economical to install as the ground and grooved bolt hole type, but stronger in the joints, and permits fittings to be turned to any radius

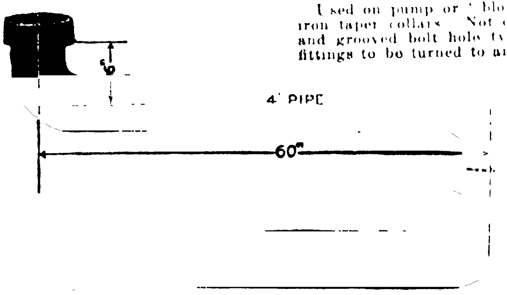

FIG. 260, 4-IN. BY 5-FT. CENTER SOCKET S-PIPES

Used as condensers or for precooling gases or in place of coils or worms Any number can be used joined together, made in any bore from in to 10 in , any center, 2 ft to 8 ft

FIG. 271, STRAIGHT LENGTH SOCKET PIPE

Notice deep and heavy grooved sockets Standard lengths 1 to 3', special lengths up to 12'.

Fig 272-A

Fig 272 B

ACID PROOF 90° AND 45° BELL AND SOCKET ELBOWS
Also make any degree elbow.

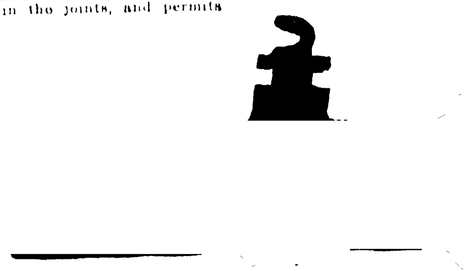

FIG 261, STANDARD ACID PROOF SLIDE DAMPER

Made in any bore pipe Flange or socket
Used for shut-off in gas lines, made to fit any bore pipe line.

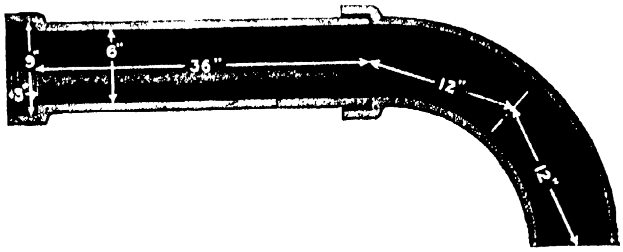

FIG 275, ACID PROOF TROUGH OR SPLIT PIPE

Made in any bore and lengths with fittings such as "Y's," Tees and Ells

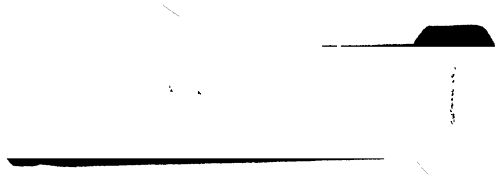

FIG. 273, ACID PROOF "T" BELL AND SOCKET PIPE

We make acid proof pipe in any bore from 1¼ in up to 42 in , and with all kinds of fittings.

Continued on Next Page

STANDARDIZE WITH KNIGHT CHEMICAL STONEWARE FAUCETS

The faucets that are tested to 60 lbs pressure

The faucets that are guaranteed to be acid proof and not to leak The faucets with the lathe cut screw thread These are Knight faucet features the faucets for tight connections Key and key seats that are tight and true

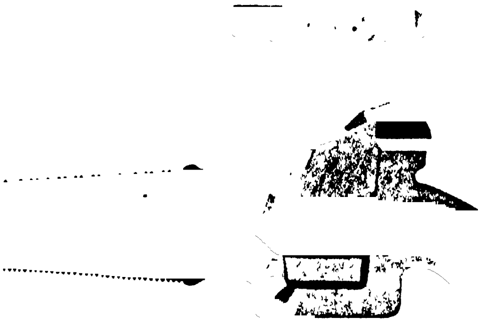

FIG. 200, ACID PROOF THREADED DRIPLESS FAUCET

With apron on key to prevent possible acid spray from reaching hands or face should key become unseated

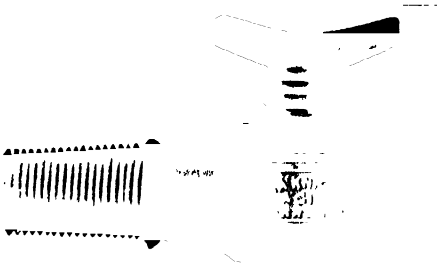

FIG. 291, THREADED SPIGOT

The flow is through the key

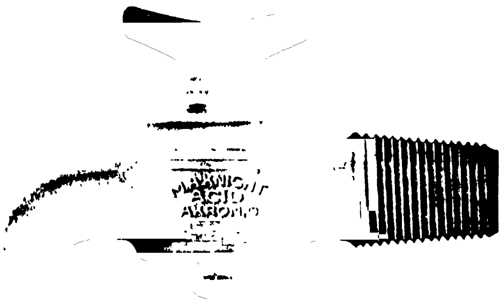

FIG 292, THREADED BIG FAUCET

All made in any bore up to 1 in Notice knob for holding lead washer

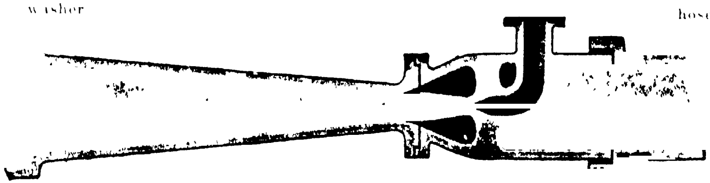

FIG 117, ACID PROOF SOCKET EJECTOR

For use as gas suction on towers, using compressed air or steam as impelling force

Send for a copy of our new and fully illustr folder. It contains information of interest on the ject of acid proof Chemical Stoneware, or come Akron, Ohio, and visit our plant and see how it is m

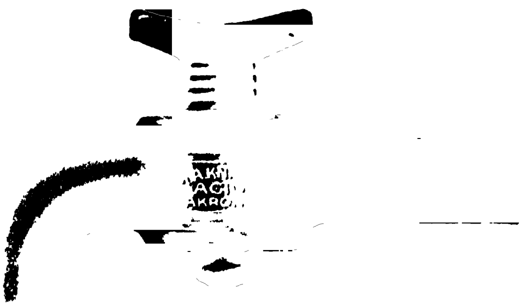

FIG 293, ACID PROOF PLAIN BIB FAUCET

Made to grind into jars and tanks Tested to 60 lbs press

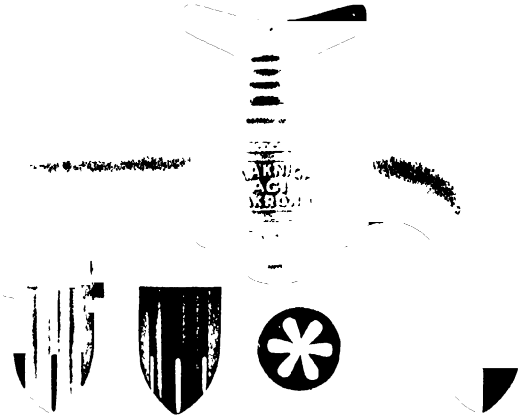

FIG 294, ACID PROOF PLAIN BIB FAUCET

Showing spray catchers We make faucets, valves and cocks in any size up to 1 in bore

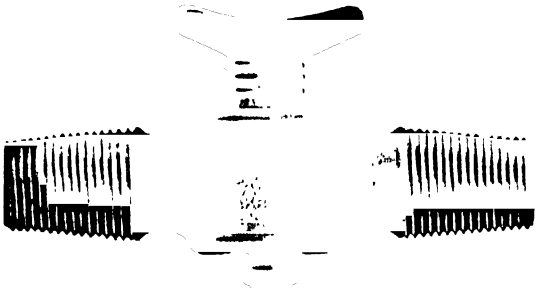

FIG. 295, ACID PROOF THREADED STRAIGHT-WAY COCK

Notice the deep, lathe cut screw threads The threads are deep and sharp and are designed to screw into either lead pipe or rubber hose thus insuring a tight and strong connection

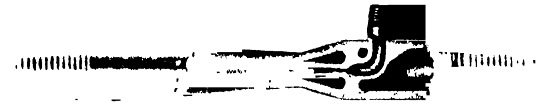

FIG. 126, ACID PROOF EJECTOR

For rubber hose or lead pipe connection With heavy, sharp, machine cut threads Uses compressed air or steam as impelling force

Continued on Next Page

The threads shown on the Faucets are for screwing lead pipe, wooden pipe, rubber hose or in connection with cement. They are of the taper type and are not to be confused with pipe thread such as is used on iron or steel pipe. For connection to iron, steel or brass pipe the flange type is used.

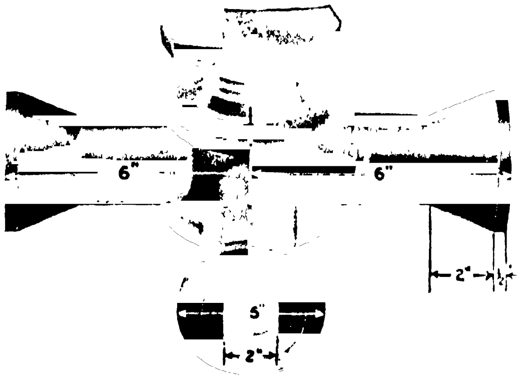

FIG. 303, CONICAL FLANGE THREE WAY VALVE

Made with 2 or 3 way keys and in any bore from ¼" up to 4"

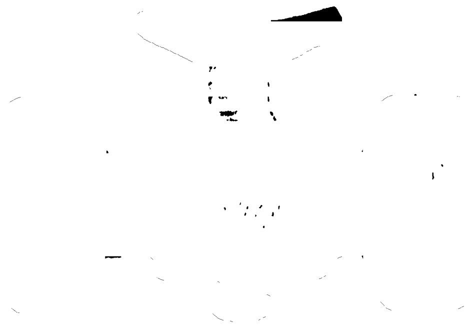

FIG. 297, FLANGED STRAIGHT-WAY STOPCOCK

Can be used with flanged pipe. Every key and faucet is marked.

FIG. 299, ACID PROOF FLANGED AND THREADED STRAIGHT WAY COCK

With apron to prevent possible acid from reaching hand or face should key become loose. Tested to 60 pounds.

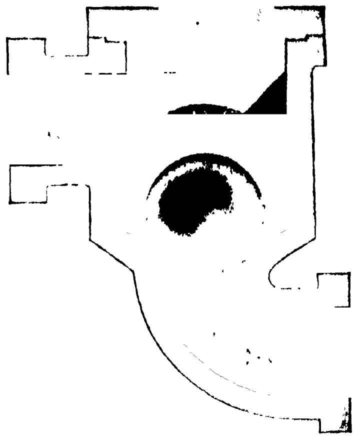

FIG. 302, ACID PROOF CHECK VALVES

Made in several sizes and designs. Guaranteed.

FIG. 300, ACID PROOF FLANGED BIB FAUCET

Faucets and stopcocks are made in any bore up to 4 in. and in all designs. All tested to 60 lbs. pressure and guaranteed acid proof throughout.

FIG. 298, BLOCK COCK

Made in any size with one or two bolts for bolting; in sizes from 1 to 6 in. bore.

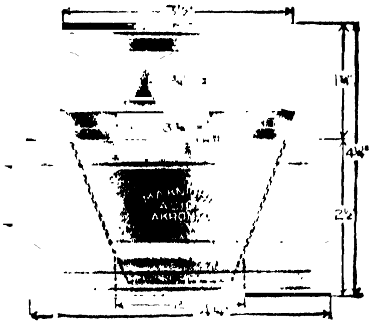

FIG. 301, ACID PROOF DROP VALVE, 2 IN.

Made in any size.

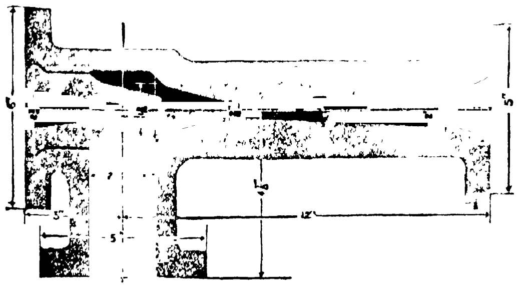

FIG. 128, ACID PROOF FLANGED INJECTOR FOR AIR OR STEAM

Made in most any design or bore. Used for lifting or forcing acids or gases. See Figs. 117 and 126.

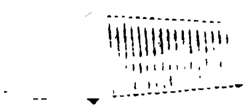

FIG. 125, ACID PROOF THREADED STEAM JET

Very simple and effective in stacks and towers. Also made with flange. Often used to develop draft instead of ejectors.

Our Faucets Are Real Faucets in Every Sense of the Word. Once Used, Always Used.

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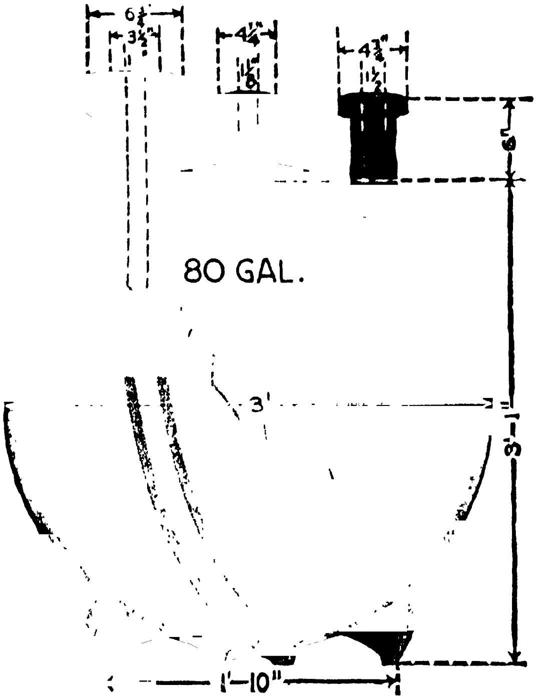

FIG. 146, STANDARD 80-GALLON BLOWCASE

We also make a standard 45 gallon size, and any other size to order. Inlet and outlet cocks with piping also furnished.

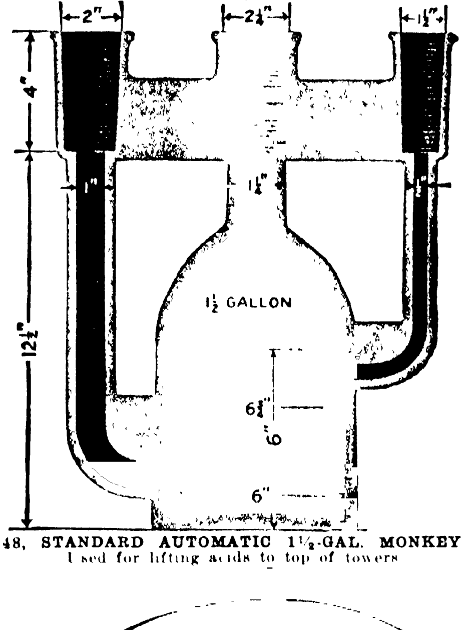

FIG. 148, STANDARD AUTOMATIC 1½-GAL. MONKEY PUMP

Used for lifting acids to top of towers

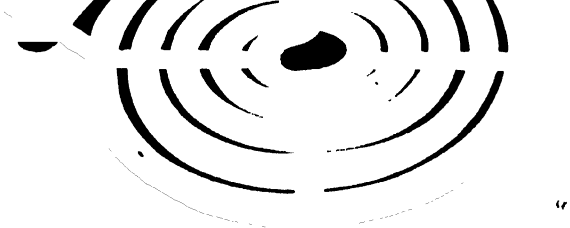

FIG. 255, STANDARD NO. 1 DESIGN FLAT AUXILIARY OR SHOCK COIL

Made in either flanged or socket connections, in any bore from ½ in. to 3 in., used in connection with larger and more expensive coils as auxiliary or as small capacity cooling or condensing coil.

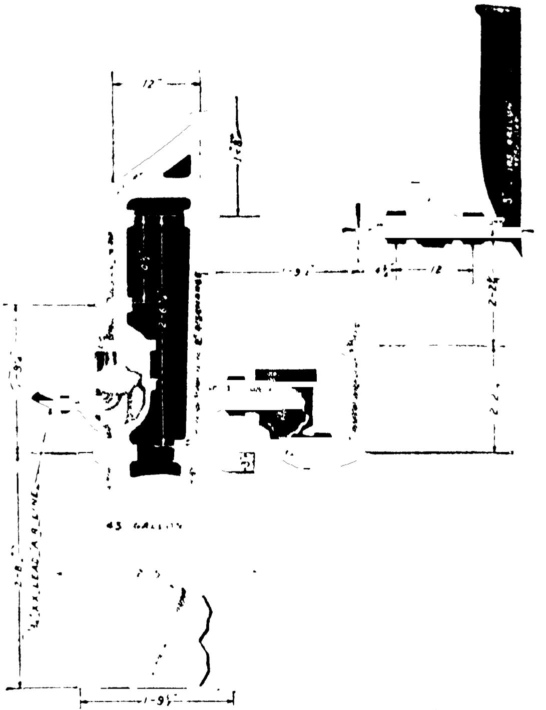

FIG. 147, STANDARD AUTOMATIC BLOW CASE

Showing storage jar, blow case, air valve, check valve outlet or discharge arm and connecting pipe.

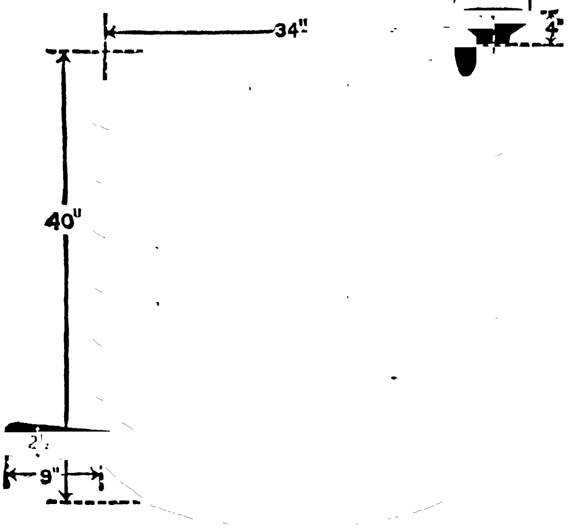

FIG. 257, STANDARD NO. 3-2" BORE PIPE VALENTINER COIL

We make coils or worms in any length or bore pipe. Top and bottom outlet in either flange or socket design

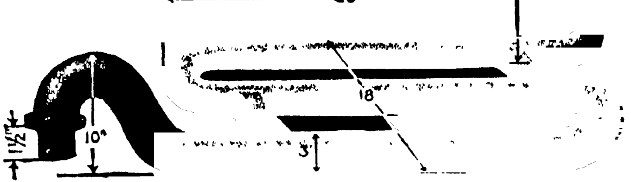

FIG. 254, ACID PROOF TANK COOLER OR CONDENSER

Made in most any bore or measurement

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The threads shown on the Faucets are for screwing lead pipe, wooden pipe, rubber hose or in connection with cement. They are of the taper type and are not to be confused with pipe thread such as is used on iron or steel pipe. For connection to iron, steel or brass the flange type is used.

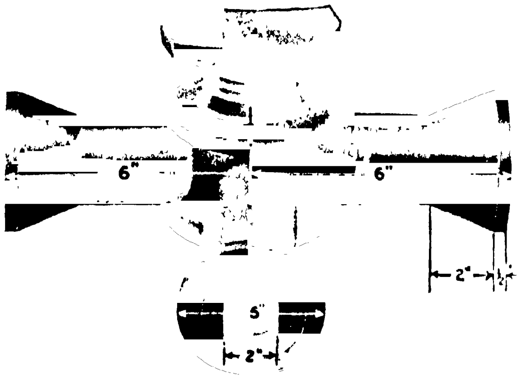

FIG. 303, CONICAL FLANGE THREE WAY VALVE

[illegible] 3 way keys and in any bore from ¼" up to 4"

FIG. 297, FLANGED STRAIGHT-WAY STOPCOCK

Can be used with flanged pipe. Every key and faucet is marked.

FIG. 300, ACID PROOF FLANGED BIB FAUCET

Faucets and stopcocks are made in any bore up to 4 in. and in all designs. All tested to 60 lbs. pressure and guaranteed acid proof throughout.

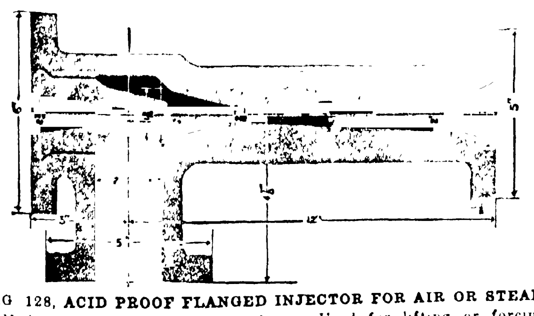

FIG. 128, ACID PROOF FLANGED INJECTOR FOR AIR OR STEAM

Made in most any design or bore. Used for lifting or forcing acids or gases. See Figs. 117 and 126.

FIG. 299, ACID PROOF FLANGED AND THREADED STRAIGHT WAY COCK

With apron to prevent possible acid from reaching hand or face should key become loose. Tested to 60 pounds.

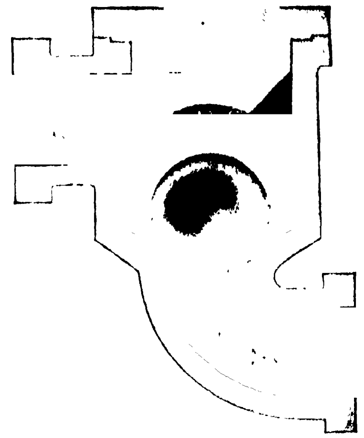

FIG. 302, ACID PROOF CHECK VALVES

Made in several sizes and designs. Guaranteed.

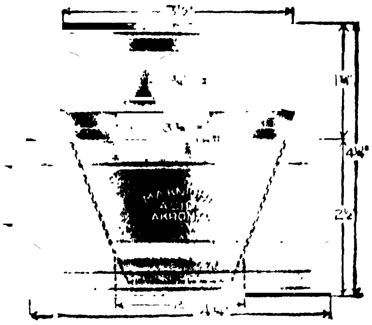

FIG. 298, BLOCK COCK

Made in any size, with one or two slots for bolts in sizes from 1 to 6 in. bore.

FIG. 301, ACID PROOF DROP VALVE, 2 IN

Made in any size.

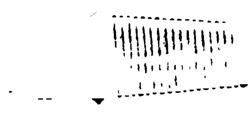

FIG. 125, ACID PROOF THREADED STEAM JET

Very simple and effective in stacks and towers. Also made with flange. Often used to develop draft instead of ejectors.

Our Faucets Are Real Faucets in Every Sense of the Word. Once Used, Always Used.

Continued on Next Page

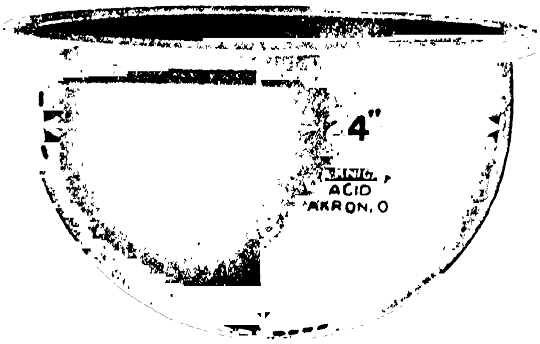

FIG 185, FLANGED RIM KETTLE, 25 GALLON

Made in any size from 5 to 100 gallon capacity Used with either sand, water or oil bath when being heated

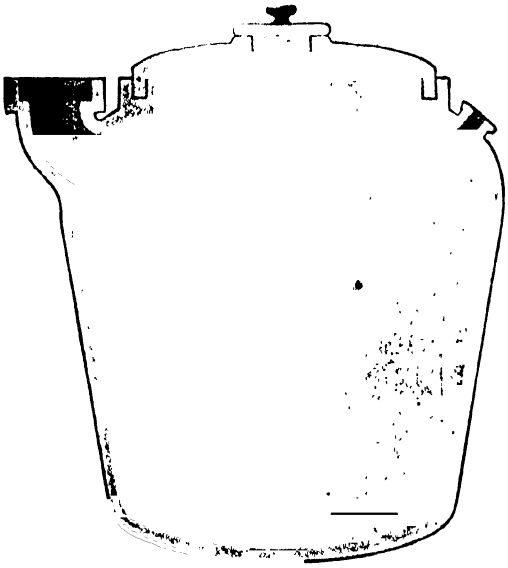

FIG 180, ACID PROOF NITRATING OR DISTILLING KETTLE

Made in any capacity from 50 to 250 gallons Cover and outlets or inlets made to meet requirements

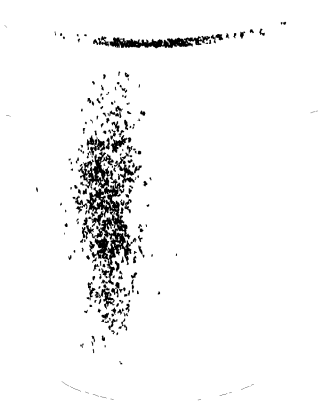

FIG 200, ACID PROOF, SEMI-TAPER, STORAGE OR MIXING JAR

Made in any capacity from 1 to 500 gallons, with faucet outlets as wished

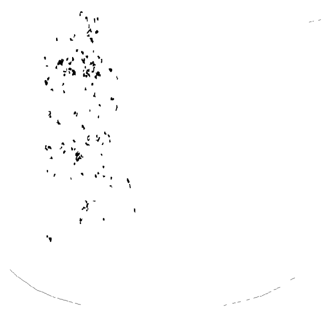

FIG. 201, ACID PROOF STANDARD STRAIGHT SIDE JAR

Made in any capacity from 1 to 500 gallons Outlets and inlets with openings or covers, as desired

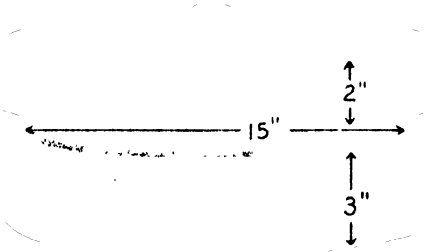

FIG 215, STANDARD ACID PROOF SUBLIMING PAN

Made in any size

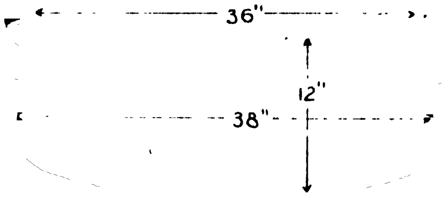

FIG 216, STANDARD SHALLOW ACID JAR

Made in any size with outlets or fittings as desired

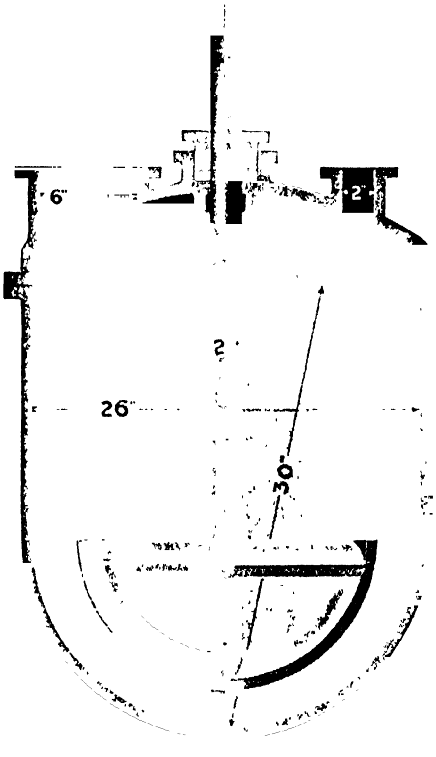

FIG. 182, ACID PROOF NITRATING KETTLE WITH STIRRER

Made in many sizes, with covers and outlets to meet requirements Note the efficient vane type stirrer, also stuffing box On large sizes the stirrer is re-enforced with a steel rod in center of shaft. Above shows ground flange cover and opening.

Continued on Next Page

ILTERS

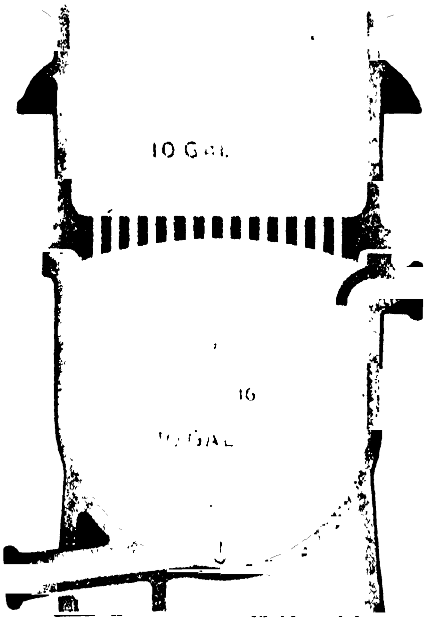

FIG 285, 20-GAL. ACID PROOF SUCTION FILTER "A"

Made in most any capacity up to 200 gallons. Furnished with faucets and cover if desired.

Used for filtering under heavy suction or vacuum. Filter or perforated plate is built exceptionally strong to withstand heavy duty. For light suction and duty use type B.

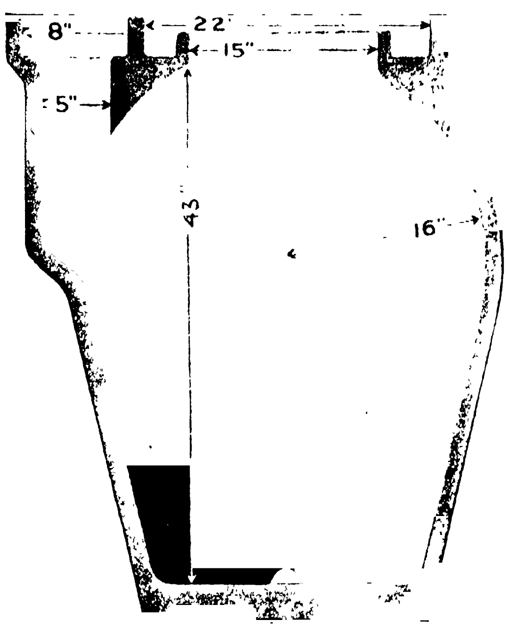

FIG. 175, STANDARD 100 GAL. ARSENIC GENERATOR

Made in all sizes and designs with inlets and outlets as desired.

REMEMBER IT IS THE BODY ITSELF

We are the only plant in the country which is devoted **Entirely** to the manufacture of acid proof chemical stoneware.

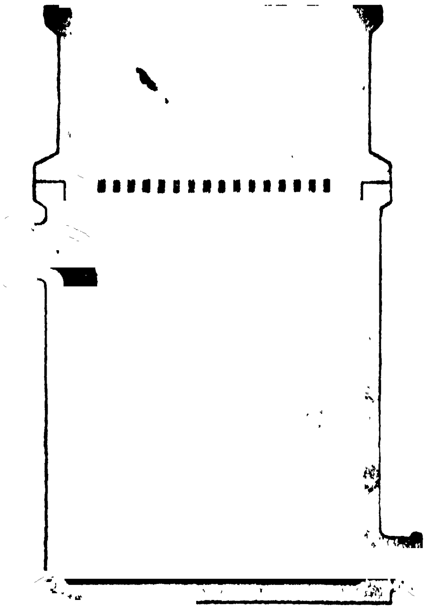

FIG 286, ACID PROOF SUCTION FILTER "B"

Made in any capacity up to 100 gallons. Furnished with faucets and cover if desired.

Used for open filtering on light or gravity suction, its chief use being in laboratory and similar work. For heavy duty and suction use type A.

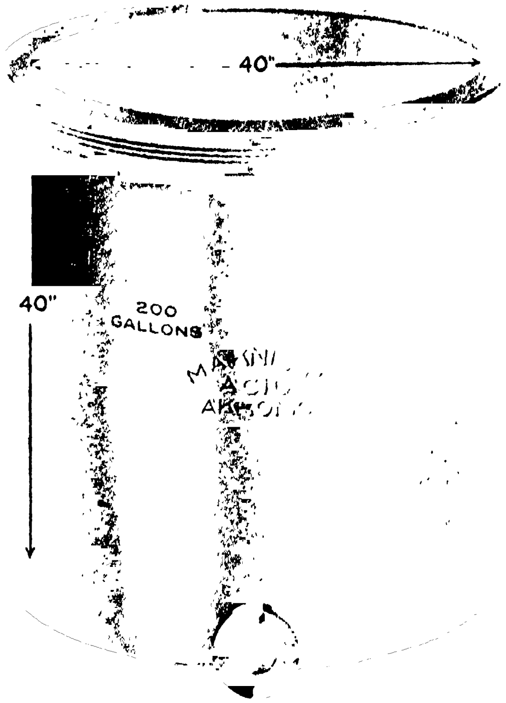

FIG 202, STANDARD 200 GAL. STRAIGHT SIDE ACID JAR

With flanged outlet for flanged faucet. We make Acid Proof Jars in any size or shape up to 500 gallons.

Continued on Next Page

The two sinks shown are to convey an idea of what is possible in this respect. We can make sinks with or without backs, with or without drain boards and with special or plain traps as required. Send us blueprint of your design as we can make the sinks to fit your special requirements.

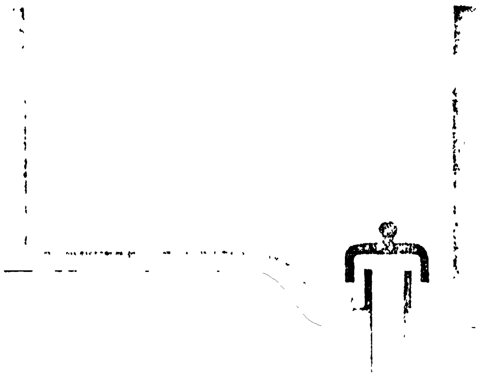

FIG. 235, ACID PROOF LABORATORY SINK, WITHOUT BACK

Showing special trap Made in all sizes and designs With complete acid proof pipe waste lines.

FIG. 236, ACID PROOF LABORATORY SINK, WITH BACK

Made in any size or design With or without back We make acid proof traps and waste lines, with all kinds of fittings.

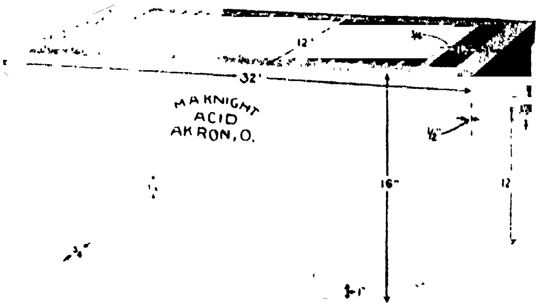

FIG. 233, ACID PROOF BATTERY OR FORMING TANK

Showing plate grooves and partitions Made in most any size or design.

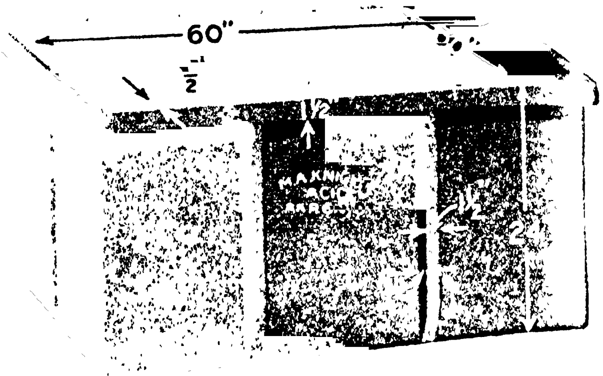

FIG. 232, LARGE SIZE ONE PIECE TANK

With strengthening ribs Made in many sizes with outlets or partitions as desired

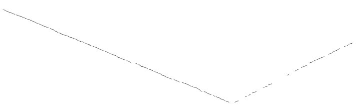

FIG. 227, ACID PROOF PHOTO TANK

Notice grooves for rods are set in, so that a glass plate covers tank tightly Furnished with faucet outlets if desired

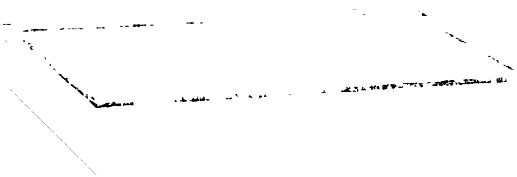

FIG. 226, LOW ACID PROOF TANK OR TRAY

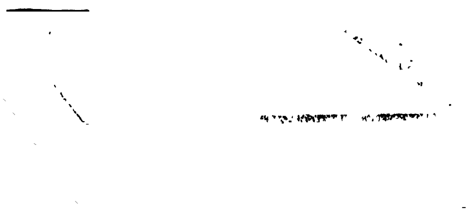

FIG. 225, ACID PROOF ETCHING TANK

With splash boards and rocker. Made in most any size, ribbed bottom, and outlets.

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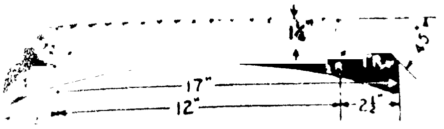


FIG. 142, ACID PROOF PIER INSULATORS

h electrolytic chlorine cells as an insulator to piers under cells Made square and

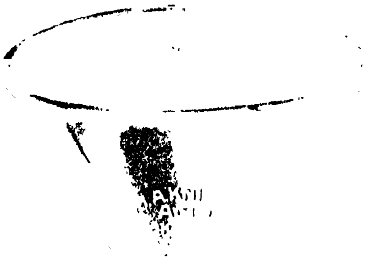


FIG. 321, ACID PROOF FUNNEL

Made in many sizes and designs

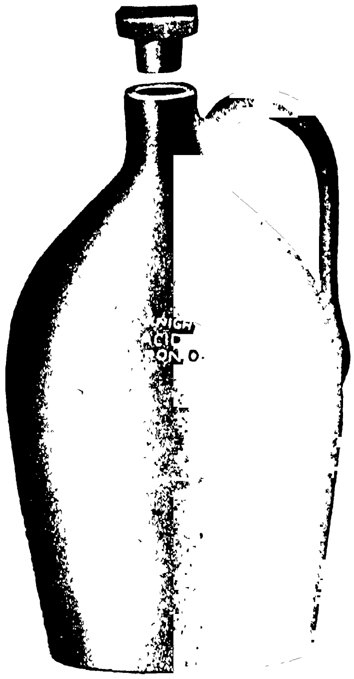


FIG. 323, ACID PROOF JUG

Made in any capacity from one pint up ten gallons Can be furnished with ground acid proof plug or cork We also make the Mercury Jugs of capacities of from one to ten pounds. Made heavy and durable

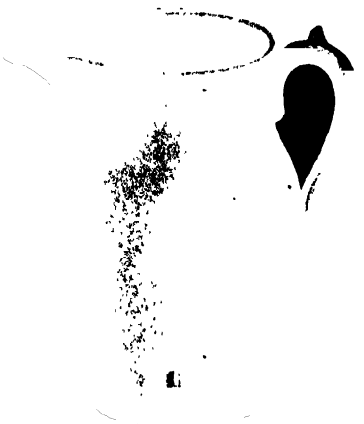


FIG 326, LARGE LIP, LARGE HANDLE ACID PITCHERS

Any capacity, from one pint to six gallons

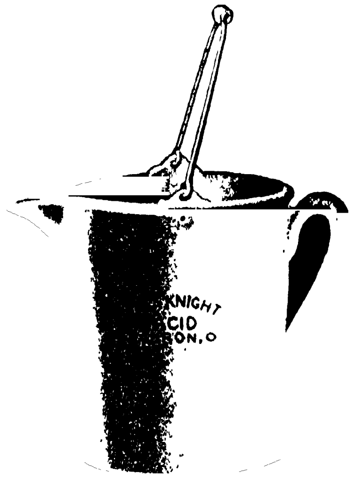


FIG. 327, ACID PROOF BUCKET

Made in capacities from one to ten gallons Furnished with or without handle or bail

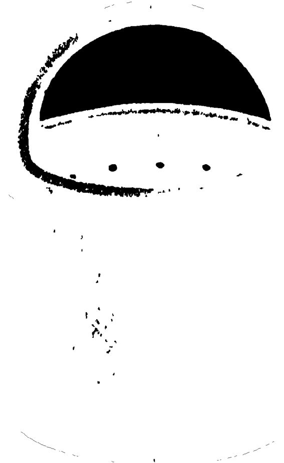


FIG. 307, ACID PROOF DIPPING BASKET

Made in all sizes with perforations from $\frac{3}{16}$ to 2 in

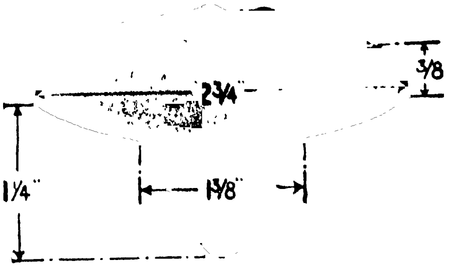


FIG. 314, ACID PROOF, WIRE BAIL, CARBOY STOPPER

This is a hard vitreous stopper with wide flange Makes a tight fit to top of carboy

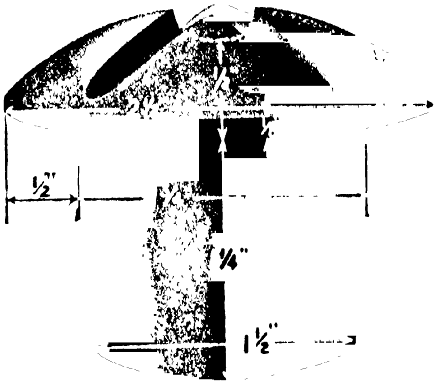


FIG 312, STANDARD POROUS CARBOY STOPPER

With grooves for wire bail Although the body is hard and tough it is also porous so that the gas will escape and not allow carboys to blow up in hot weather

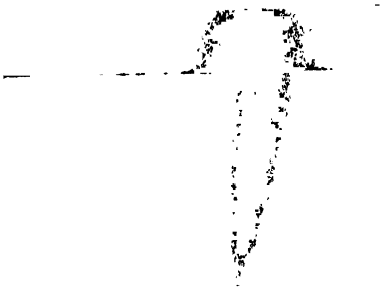


FIG. 315, STANDARD ACID PROOF CARBOY STOPPERS

Made true and even, so as to fit neck of carboy snug Carried in stock Made in several sizes

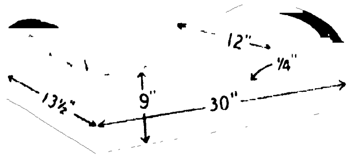


FIG. 306, PERFORATED DIPPING TANK

Made in most any size, with hole from ⅛ to 1-inch.

JOS. KOPPERMAN & SONS

Coppersmiths and Machinists

308, 310, 312 FLORIST ST., PHILADELPHIA, PA.

NEW YORK CHICAGO

PRODUCTS

We design and fabricate any style Column Still, Kettle with or without Agitator, Tank, Autoclave, Condenser, Vacuum Apparatus, Evaporator, Digestor, Subliming Pan, Strike Pan, Crystallizing Pan, or Tanks, Plain or Pressure Percolator, Coating Pan, Separator, Filter, Dreg Still, Non-foaming Plain and Vacuum Still, Coil, Expansion Joint, Piping, Bends, etc., for Chemical, Pharmaceutical, Dyewood and Tanning Extract Industries.

Also for Candy, Food Products, Sugar Manufacturers, Varnish, Wood Alcohol and other allied industries in Copper, Brass, Iron, Lead and Monel Metal.

EXPERIENCE

We have been in the Coppersmithing business for generations, hence our name **"Kopperman."** Don't you think we ought to know how? Give us a trial and be convinced.

FACILITIES

Our Plant is one of the most modern equipped Coppersmithing Shops in the Country. Most machinery and tools used in fabrication of copper work were designed by the **Kopperman** folks themselves, who being first class practical mechanics themselves, know what equipment is required that will produce a piece of Apparatus that will be neat, durable, and give thorough satisfaction to our customers.

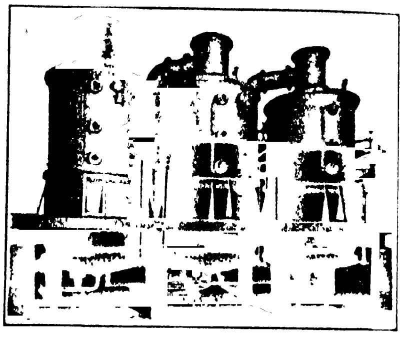
All details of construction are watched by two members of the **Kopperman** family. Also all tests are witnessed by a **Kopperman.** The **Koppermans** are very keen on good and neat work, and have made a host of friends with their untiring efforts—to please their customers.

SERVICE

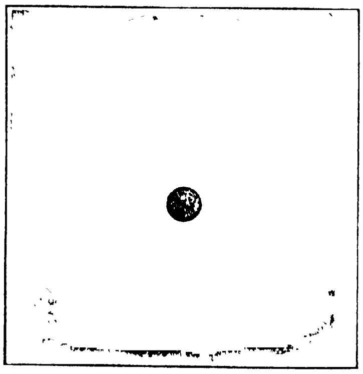
Aside from the work, we have an engineering department which is at your service to make up special designs or help our clients develop designs.

PRICES, INFORMATION

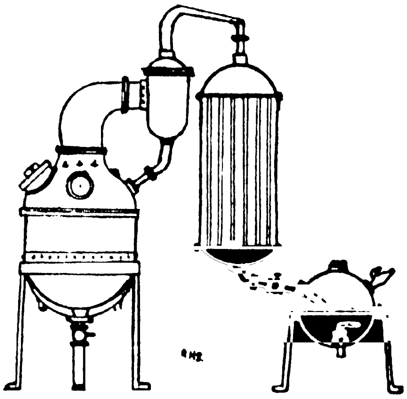
We solicit from the above mentioned industries — inquiries for prices, information, etc. Buyers will find us interesting.



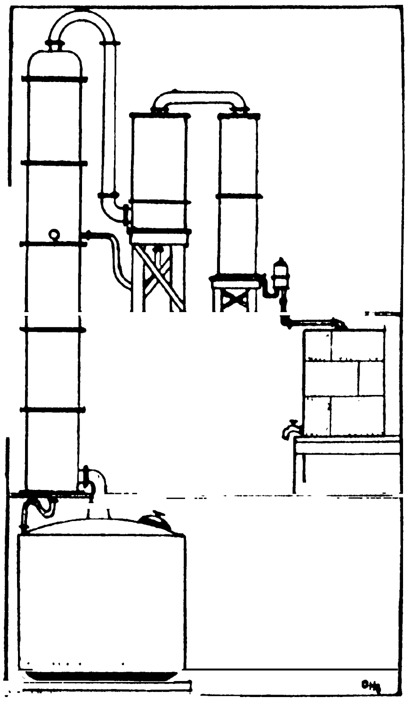
MULTIPLE EFFECT EVAPORATOR



12 FT. DIAM. SUGAR COIL VACUUM PAN

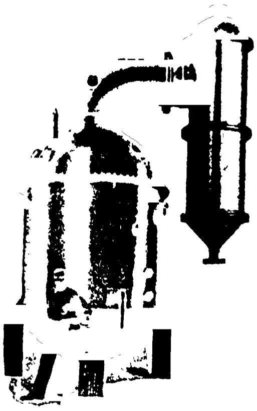


SOLVENT RECOVERY COPPER VACUUM STILL
With Tubular Condenser and Receiver



INDUSTRIAL ALCOHOL COLUMN STILL

COPPER VACUUM RECOVERY STILL
With Coil Condenser, Vacuum Receiver and Pump Connected



7 FT. DIAM. MILK VACUUM PAN WITH CATARACT CONDENSER

L. O. KOVEN & BROTHER

MAIN OFFICE: 154 OGDEN AVENUE, JERSEY CITY, N. J.

NEW YORK OFFICE 50 CLIFF STREET

PRODUCTS

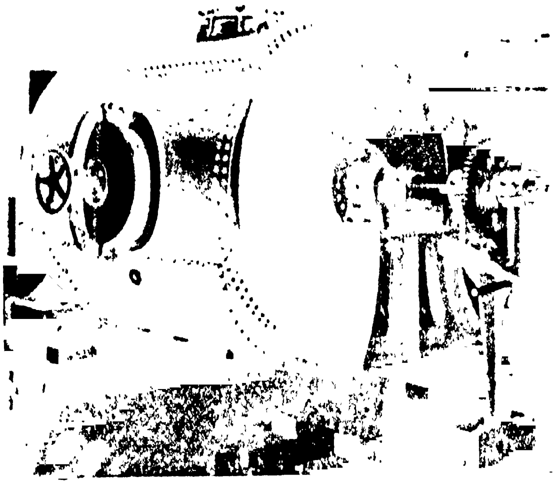
- Acid Tanks
- Agitators
- Autoclaves
- Steel Barrels
- Sterilizing Cars
- Condensers
- Creosoting Cylinders
- Hydraulic Cylinders
- Coal Chutes
- Steam Drums
- Vacuum Dryers
- Oil Filters
- Tank Filters
- Water Filters
- Melting Furnaces
- Feed Water Heaters
- Oil Heaters
- Humidifiers
- Automatic Weighing Machines
- Blending Machines
- Milk Machinery
- Paint Machinery
- Rubber Reclaimers Machinery
- Mixers, All Kinds
- Bottle Filling Machines
- Enameling Ovens
- Hydraulic Steel Riveted Pipes
- Filter Presses
- Gas Producers
- Air Receivers
- Steel Smoke Stacks
- Bottle Sterilizers
- Oil and Tar Stills
- Gas Scrubbers
- All kinds of Tanks
- Water Stills

Copper Kettles, Iron or Brass, any design

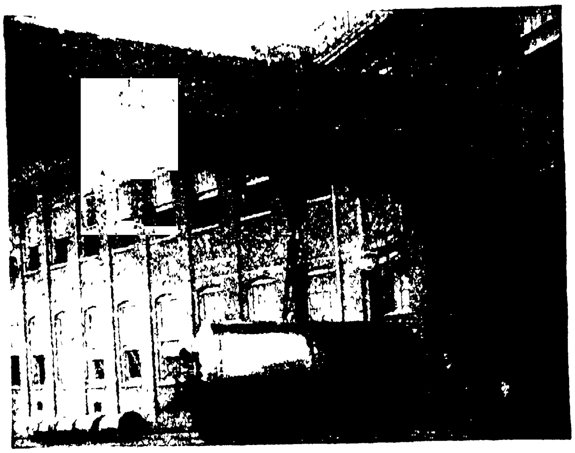
FACILITIES

We are Engineers, Designers, and Constructors of Plate and Sheet Metal Work for All Industries.

Tank Builders, Machinists, Coppersmiths, Galvanizers, Builders of Apparatus for Chemical Works.

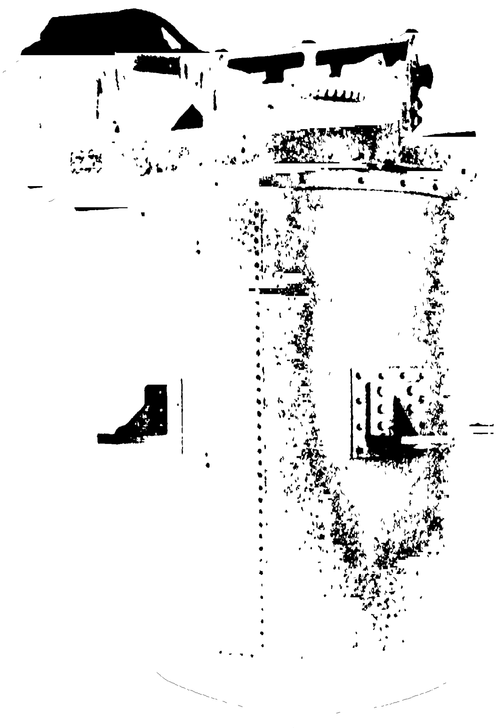


TUMBLING MILL
Part Jacketed with Worm Hand Drive



HIGH PRESSURE STORAGE TANKS

BATTERY OF MIXERS FOR HEAVY DUTY



DIRECT DRIVEN VERTICAL MIXER
Clutch for Reverse Motion, Steam Jacketed Bottom

KUTZTOWN FOUNDRY & MACHINE COMPANY

INCORPORATED

Founders and Machinists

1421 Chestnut Street
PHILADELPHIA, PA.
WORKS: KUTZTOWN, PA.

PRODUCTS

Castings

- Acid resistant
- By-product Coke Oven
- Chemical
- Condenser
- Denitrator
- Dryer
- Evaporator
- Expansion Tank
- Filter Press
- Furnace
- Grey Iron
- Heater
- Incinerator
- Jacketed
- Kettle and Kiln
- Machinery
- Nitrator
- Oven
- Power Plant
- Preheater
- Retort
- Saturator
- Semi-steel
- Sulphonator
- Tank
- Vacuum Dryer
- Vacuum Pan
- Washer

Machinery

- Garbage Reduction and Degreasing Plant
- Fertilizer and Waste Product Plant

SERVICE

We build cast iron equipment to drawings and specifications, making such tests as may be necessary.

Equipment cast in more than one piece is assembled before shipment to insure accurate fit.

PLANT

Our plant at Kutztown, Pa., consists of pattern shop, foundry, machine shop, storage sheds and yard, equipped with the most modern machinery for preparing moulds, machining and finishing castings, and the handling of heavy pieces from one part of the plant to another.

The foundry is equipped to handle castings of any shape and size up to 15 tons, poured in green or dry sand or loam moulds.

Castings up to 16 feet long and 16 feet in diameter can be finished in our machine shop which is equipped with suitable boring mills, lathes, planers, drills and other machinery.

CASTINGS

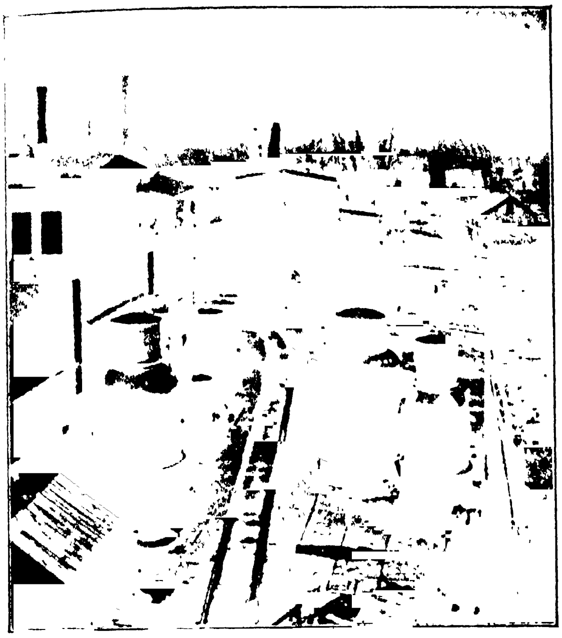
Special attention is given to the mixture of the iron, which is controlled by analysis to secure a casting of the proper structure, suitable for the intended use.

INTERIOR VIEW OF FOUNDRY

INTERIOR VIEW OF MACHINE SHOP

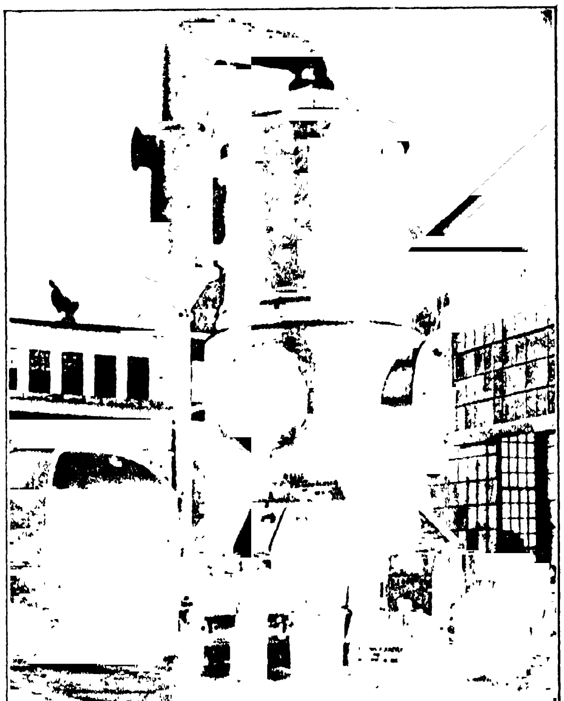
Continued on Next Page

The illustration below shows several evaporators e erection yard The crane in the background is ng the top on one of them.



EVAPORATORS IN ERECTING YARD

Below is illustrated a 9′ 6″ condenser set up in the yard prior to shipment Note assembly markings

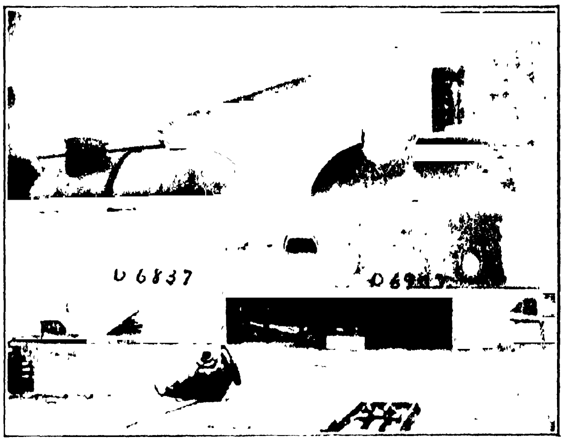


CONDENSER

A fair example of the large irregular castings we are equipped to pour, for power plant and industrial purposes, is shown in the following illustration

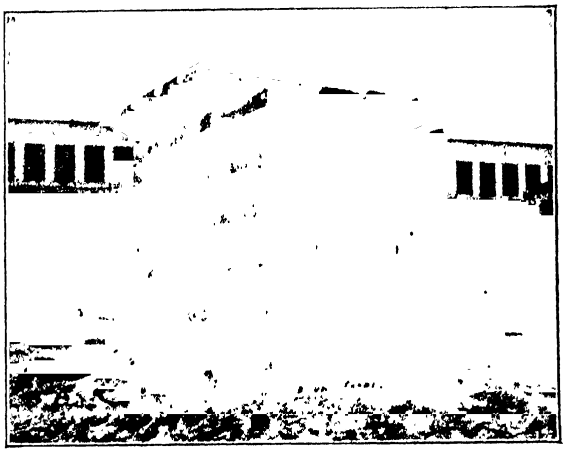
IRREGULAR CASTINGS

The two saturators shown in the next illustration are representative of castings produced by this company for use in the by-product coke industry



SATURATORS

The stack of door frames shown is a good example of our facilities for quantity production.



DOOR FRAMES

LACLEDE-CHRISTY CLAY PRODUCTS COMPANY

Refractories and Automatic Stokers

ST. LOUIS, MO.

BRANCH OFFICES

New York, N. Y., 50 East 42nd Street
Pittsburgh, Pa., 901 Oliver Building
Detroit, Mich., 835 Book Building
Chicago, Ill., 1366 Peoples Gas Building

Trade Mark

PRODUCTS

Laclede-Christy Refractories for Industrial, Chemical, Metallurgical and Power Plant Purposes; Fire Brick and Suprafrax Brick in Standard and Special Shapes.

Settings for Stills, Autoclaves, Retorts, Acid Concentrators, Acid-proof Brick, Tile and Rings for packing acid-towers, Muffles, Dryers, Boilers, etc. Linings for Special Furnaces, Kilns, Dryers, Pulp Digestors, etc.

Vitrified Products (Sewer Pipe, Segment Blocks, Wall Coping, Hollow Tile, Flue Linings).

Furnaseal—Plastic Refractory Cement.

Laclede-Christy Chain Grate Stokers; Stowe Stoker; Laclede-Christy Flat Arches and Flat Arch Tile.

Archnu, a High Temperature Cement.

High Pressure Water Backs.

LACLEDE FIRE BRICK

We furnish Chemical analysis of any brands on request

Laclede-King Brick—Made by the dry press process Of even texture, contains no laminations, and its expansion and contraction at working temperatures is practically nil This quality prevents spalling or cracking, which recommends its use where sudden changes of temperature occur

According to the specifications for fire brick set by the Bureau of Standards at Washington, Laclede-King brick ranks above the test required for High Heat Duty Brick, and we commonly style this brand "High Grade" The Government tests give cone 32 plus as the fusion point, which is about 3218°F

Laclede-Crown Brick—A stiff mud process brick Resists abrasion, destructive slagging action, and has remarkable load-bearing strength at high temperatures

Ranks above the test required for High Heat Duty Brick according to specifications of the Bureau of Standards The Government tests give cone 32 plus as the fusion point, which is about 3218°F

Laclede-St. Louis Brick—Made by the dry press process A most reliable brick for general furnace work Of even texture, free from laminations, and its expansion and contraction at working temperatures is very low. It resists sudden changes of temperature well, and does not spall

According to the specifications of the Bureau of Standards, Laclede-St. Louis Brick ranks above the test required for Intermediate Heat Duty Brick and we designate this brand as No 1 grade The Government tests give cone 29 plus as the fusion point, which is about 3100°F.

Laclede-Christy-St. Louis Brick—A stiff mud process brick No. 1 Grade. Designed to resist abrasion and clinker action For service where the fire brick are subjected to mechanical wear, this brand is particularly well adapted, due to its hard, dense nature

According to specifications of the Bureau of Standards, this brand ranks above the test required for Intermediate Heat Duty Brick The Government tests give the fusion point as cone 29 plus, which is about 3100°F

Recent tests show the following compressions and contractions for "Laclede-St Louis" and "Laclede-Christy-St Louis" Fire Brick.

	Laclede St Louis Brick	Laclede Christy-St Louis Brick
Compression in 1350°C load test of 25 lbs per sq in	5 3%	3 1%
Contraction after 5 hours at 1400°C.	36%	22%
Fusion Cone	30½	30¾

Laclede-Special-Crown Brick—A hand-made brick of extra high quality Very refractory, because of the unusually high proportion of Flint Clay Its low initial porosity makes it resistant to slags and molten metal. Does not spall or crack under changing temperatures Government Tests give cone 33½ as the fusion point, which is about 3272°F.

Suprafrax Brick—A hand-made, super-refractory, with an equal in the fire brick field Alumina content of over 7 which tends to class it as a basic refractory, the Ceram however, define it as *neutral* in action

Suprafrax has great strength, and it is the most refractory brick the Laclede-Christy line It ranks much higher than the test scribed for High Heat Duty Brick, according to the specifications by the Bureau of Standards In the Government tests the tempera of 3300°F was reached without fusing this brick, and from t made in our own and other laboratories the temperature of 3400 was shown to be *below* the fusion point

FURNASEAL

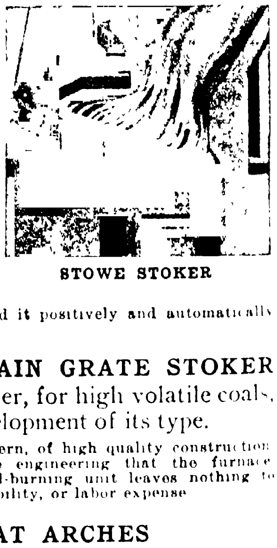
A wet plastic refractory cement, to replace fire clay a mortar for furnace brick work, either fire clay or silica C be used for the entire lining of small furnaces, furnace doors ladles, etc Also ideal for general repair purposes

SILICATE OF SODA FURNACES

As high temperatures are necessary in this melting process and severe fluxing action takes place during the operation, high grade refractories, such as Laclede-Christy make, should be used throughout The designing, engineering and construction of the entire plant may well be left to the Russell Engineering Co, St Louis, a subsidiary of Laclede-Christy

STOWE STOKER

This is a forced-draft type, whose fundamental principle is conveyor feed, positive in action from coal hopper to ash pit. These are a few compelling features



STOWE STOKER

(1) A single Stowe Stoker can be used for units up to 1500 h p, thus doing away with the center furnace wall

(2) The tuyeres are provided with graduated air spaces arranged to proportion the air correctly to the gradually varying requirements of the burning fuel bed The design of the tuyeres is such that drippage is reduced to a negligible minimum

(3) It is the only conveyor feed built on a divided incline and therefore excels in strong ignition temperatures

(4) It is the only conveyor feed that holds the nearly spent fuel back on the grate until every bit of combustible is consumed

(5) It does not form clinkers, and it positively and automatically discharges the ash from the furnace.

LACLEDE-CHRISTY CHAIN GRATE STOKER

This is a natural-draft stoker, for high volatile coals, representing the highest development of its type.

It is of the self-cleaning link pattern, of high quality construction and is installed with such capable engineering that the furnace stoker and draft facilities as a coal-burning unit leaves nothing to be desired in economy, capacity, flexibility, or labor expense

LACLEDE-CHRISTY FLAT ARCHES

Can be successfully used in any place where a crown or top is required for a hot furnace.

The design of the supporting structure of the arch is based on the multipiece or sectional idea, which contributes to the strength and flexibility of the arch and makes possible the adoption of long arches

We manufacture the tile as well as the iron work We also carry in stock shapes of all other brands of tile L-C Flat Arch Tile are made of absolutely dependable and always uniform materials.

ARCHNU

This is a high temperature cement in dry form for repairing spalled or cracked furnace arches of every type. In addition to being the ideal cement for repairing arches, Archnu is adapted to laying up fire brick, patching furnace walls, patching ledge tile, etc.

W. M. LALOR COMPANY

Apparatus for the Purification of Water for Drinking and Manufacturing Purposes

GENERAL SALES OFFICE
Continental and Commercial Bank Building
CHICAGO, ILL.

FACTORY
108 N. Jefferson St.,
Chicago, Ill.

PRODUCT

The Improved "Rochlitz" Automatic Water Still.

DESCRIPTION

This is an apparatus for the purification of water by new methods, which effect a high degree of efficiency and cheapness of operation.

A combined condenser, purifier and aerator for producing a pure and palatable water for drinking and manufacturing purposes.

The Improved "Rochlitz" Automatic Water Still will furnish a steady stream of pure, distilled water free from carbonic acid and volatile impurities without any attention whatever as long as the gas or steam and water supply holds out.

The height of the dome is such that only pure, dry vapor can enter the condenser.

There are no parts to corrode, as it is constructed entirely of copper and brass, and lined throughout with purest block tin.

An ideal apparatus for—

Chemists	Laboratory Work
Assayers	Storage Batteries
Physicians	Residences
Druggists	Schools
Photographers	Hospitals
Perfumers	

and where absolutely pure water is essential and desirable.

The United States Government has purchased approximately one thousand "Rochlitz" Water Stills for service in this country and overseas.

"Rochlitz" Water Stills invariably exceed their rated capacity.

Distinctive Features—The remarkable efficiency of the "Rochlitz" Still is due to the following:

Scientific Construction of the Still

Asbestos Lined Apron

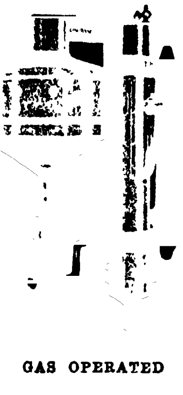
Type of Burners used

Cone Shaped Asbestos Lined Baffle

Gas Operated Type—Operates equally well with artificial or natural gas.

Delivers absolutely pure, cold aerated, distilled water at a cost of less than two cents per gallon on a basis of $1.00 per M for gas.

Capacities ½ to 5 gallons per hour.

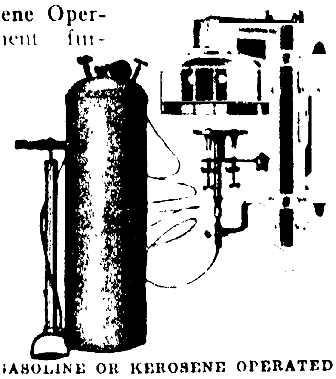


GAS OPERATED

Gasoline or Kerosene Operated Type—Equipment furnished includes Pressure Tank, Pump, Gage, Valves, Hollow Copper Tubing, Special Kerosene or Gasoline Burners, etc.

Our Kerosene and Gasoline Burners are powerful, wickless, odorless.

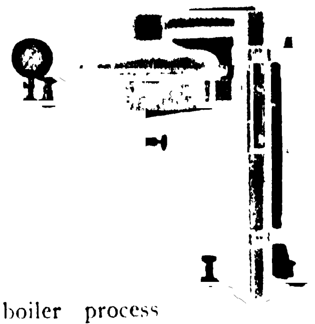
Capacities ½ to 5 gallons per hour.



GASOLINE OR KEROSENE OPERATED

Steam Operated Type—Attachable to any boiler. Costs little to install. Simple and effective to operate. Produces water at cost of ⅓ of one cent per gallon. Will purify water however bad. All impurities thrown down in boiler process are flushed out at apex at conical bottom of boiler chamber.

Capacities 1 to 20 gallons per hour.



STEAM OPERATED TYPE

Electrically Operated Still—Equipped with Bayonet Type Immersion Heaters.

The heater is easily cleaned because removable. Is highly efficient because all the heat must go into the liquid.

Heating units furnished for all standard voltages up to 250 volts; alternating or direct current.

Control Switch and 6 feet of cord supplied.

Capacities, ½ to 5 gallons per hour.

ELECTRICALLY OPERATED STILL

GUARANTEE

We guarantee all material and workmanship entering into the construction of the Improved "Rochlitz" Automatic Water Still to be the best of its respective kind, and we will furnish new parts to replace any proving defective, within one year from date of sale, due to faulty material or workmanship.

SEND FOR OUR BULLETIN ON STILLS

LANCASTER IRON WORKS

Tanks and Steel Plate Construction

LANCASTER, PA.

NEW YORK OFFICE 501 Fifth Avenue

Incorporated 1910

PRODUCTS

Steel Plate Products

Tanks

- Acid
- Air
- Blow-off
- Car
- Chemical
- Condenser
- Dipping
- Expansion
- Filtering
- Field Storage
- Galvanizing
- Gasoline
- Grain
- Hot-Water
- Hydro-Pneumatic
- Jacketed
- Knocked-down
- Mixing
- Molasses
- Oil Storage
- Pressure
- Rectangular
- Rendering
- Settling
- Soap Factory
- Storage
- Tar
- Turpentine
- Vacuum
- Varnish

Chemical Apparatus and Special Machinery

- Accumulators
- Acid Eggs
- Agitators
- Autoclaves
- Benzol Washers
- Condensers
- Cooling Towers
- Crystallizers
- Digestors
- Evaporators
- Fusion Pots
- Kettles
- Kilns
- Nitrators
- Purifiers
- Reducers
- Retorts
- Rotary Dryers
- Rotary Filters
- Stills
- Sulphonators
- Vats
- Vulcanizers
- Washers

Pipe

- Straight Riveted Pipe
  (for any purpose or pressure)
- Hydraulic Mains
- Land Pipe (for dredging)
- Pontoon Pipe (for dredging)
- Steel Pontoons
- Dredge Pipe Accessories
- Ball Joints, Gate Valves, Y's, etc.

Stacks and Breechings

Field Storage Tanks

All kinds of Steel Plate Work

Built and Erected by Our Own Crews.

LANCASTER ERECTING CREWS

Each piece of work erected by us is put up by our own crews. These erecting crews are an integral part of our organization and their work is the final factor in the complete service we put at the disposal of our customers. Each job we undertake is guaranteed to be completed to our customer's entire satisfaction.

ORGANIZATION

Every man in the organization of the Lancaster Iron Works is individually interested in the success of the company. Every man is an expert in his line. The personality of the business has grown from one man who willed that it must succeed to twelve directing heads who have the same determination. The friendliness and cooperation existing between the officers and men of this company is Insurance to our customers that there will be no strikes or disagreements to hold up their work.

SHOPS

Plate	Machine
Pattern	Foundry

The Lancaster Plant is composed of the above four units. This is an unusual combination and permits us to take any Steel Plate Construction order and do all the work in our own shops. In this way we know the work is done right as we control all the factors which affect production. It means that your order will not be split up and parceled out to three or four different concerns. We are equipped to turn out 25,000 tons of fabricated steel plate per year.

RESOURCES—RESPONSIBILITY

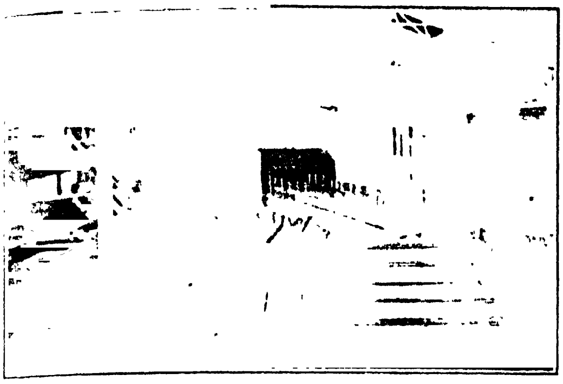
Today, when big work is to be given out, Engineers and Purchasing Departments scrutinize first the responsibility of the concerns bidding, and secondly the price. A bid too low carries its own danger signal.

The financial standing of the Lancaster Iron Works is such that we are able to handle any size undertaking. Our equipment and location enable us to turn out work promptly and satisfactorily.

LANCASTER SERVICE

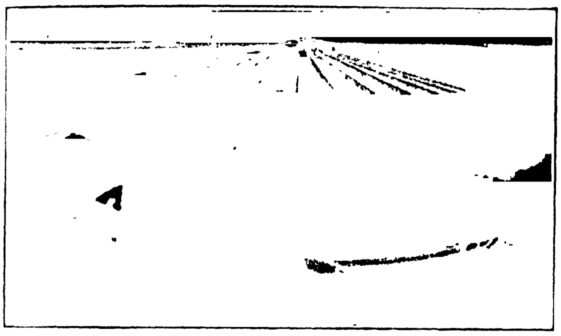
The Lancaster Iron Works puts at the disposal of every customer and prospective customer a trained and experienced Engineering staff skilled in the design and construction of steel plate work. The cumulative experience gained by the men of our organization through their years of experience is built into every piece of Lancaster equipment and is at the disposal of any one calling upon us.

Continued on Next Page



INTERIOR VIEW OF SHOPS, SHOWING SHIPMENT OF LANCASTER RIVETED STEEL PIPE

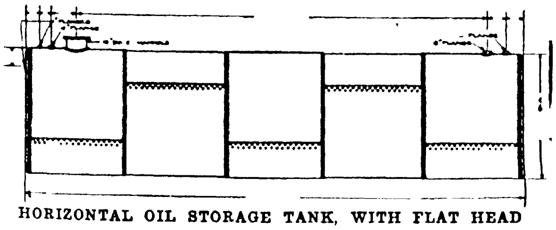
Riveted steel pipe, for any purpose and pressure varying from [illegible] in diameter up, of any desired length or thickness is manufactured by us. Lancaster dredge pipe is used along the whole coast from Boston to Galveston.



STANDARD FIELD STORAGE TANK

The standard field storage tanks carried in stock by us range in size from 355 barrels to 55,000 barrels We are in a position to ship any size tank on short notice.

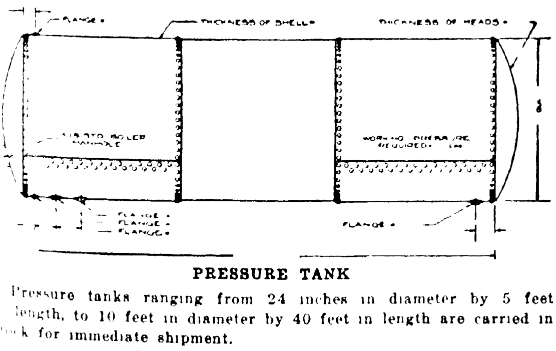
See the Lancaster Tank Bulletin



HORIZONTAL OIL STORAGE TANK, WITH FLAT HEAD

Horizontal storage tanks ranging in size from 1,000 gallons to [illegible] gallons are carried in stock for quick delivery

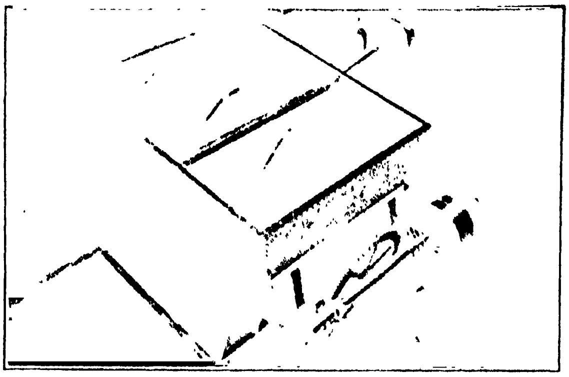
See the Lancaster Tank Bulletin



PRESSURE TANK

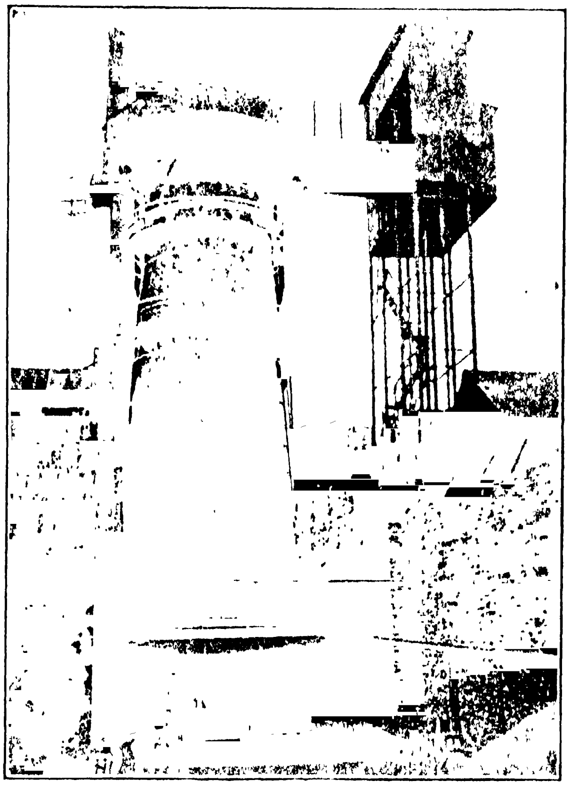
Pressure tanks ranging from 24 inches in diameter by 5 feet length, to 10 feet in diameter by 40 feet in length are carried in stock for immediate shipment.

See the Lancaster Tank Bulletin



SPECIAL MIXING APPARATUS, SHOWING INTERIOR WITH CURVED BLADES

This special mixing apparatus shows a piece of work which required the highest type of workmanship Note the curved knives

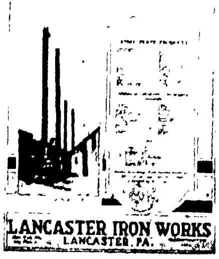


SPECIAL RIVETED STEEL CUPOLA, WITH BRACING, LADDERS, DECKS, FRAMEWORK, ETC., COMPLETE

Here is a steel cupola designed by the Lancaster Engineering Department, fabricated in the Lancaster shops and erected by a Lancaster erecting crew. It shows the intricate work we are equipped to handle

LANCASTER TANK BULLETIN

This is the new Lancaster Tank Bulletin. It contains a list of the equipment manufactured by us and detailed specifications of the various tanks which we carry in stock.



Lancaster

LANCASTER IRON WORKS
LANCASTER, PA.

LAMMERT & MANN CO.

Manufacturers of Rotary Vacuum Pumps; Engineers and Machinists

Walnut and Wood Streets
CHICAGO, ILL.

Telephone
WEST 1918

Trade mark

PRODUCTS

Lammert Rotary Vacuum Pumps, Air and Water Cooled, for any high, dry vacuum service and pressure up to 25 lbs.

Lammert Pressure Pumps.

Water Cooled Rotary Blowers.

LAMMERT PUMPS

Lammert rotary dry vacuum and pressure pumps are made in a variety of types and sizes to meet the numerous service requirements.

For the past twenty years **Lammert & Mann Co.** have been making vacuum pumps and some of the largest concerns in America are using them with absolute satisfaction. They have demonstrated by actual on-the-job performance their superior adaptability in meeting the exacting requirements of the work for which they were designed.

WIDE RANGE OF USES

Lammert Vacuum Pumps—Used for canning, preserving, milking, in chemical laboratories and for many varied special purposes where high, dry vacuum is required

They are also adapted to the priming of centrifugal pumps, for which we have our automatic control

Lammert Pressure Pumps—Used for agitating liquids, cleaning generators, for machine shops, and any service where pressure up to 25 lbs. can be used.

DISTINCTIVE FEATURES

Lammert pumps are dependable, economical and require the absolute minimum of attention. The oiling systems are flawless. The air cooled and small water cooled pumps are equipped with the capillary type of oiling—oil fed to the bearings and all moving parts by capillary attraction—very economical and efficient.

The large pumps are equipped with automatic oilers which deliver a constant flow of oil to the internal mechanism through the bearings, after which the oil is separated from the exhaust air and returned to the oil chamber to be used over and over again. This feature not only reduces the operating cost, but also cuts the attention required to the minimum.

The smaller pumps may also be equipped with the automatic oiling feature, if desired.

ADVANTAGES

There are no valves to stick, no pistons to wear, no cranks or connecting rods to complicate the working parts and consume power.

Lammert pumps are simple, compact and require little floor space.

They are quiet running without vibration. All parts are standard and interchangeable and each part is rigidly inspected and every pump is tested to its full rated capacity.

Every Lammert pump carries a full guarantee against faulty workmanship or material.

TYPES AND RELATIVE VACUUM RATINGS

Lammert pumps may be had air or water cooled, belt or motor driven. The air cooled pumps are designed for intermittent service and will develop a 26-in vacuum at sea level. The water cooled types are for continuous duty and will easily maintain a 27½-in vacuum at sea level.

The two-stage, high duty vacuum pumps are guaranteed to maintain a vacuum within ½ in of the barometer and can be made to do within 1/10 in.

For special requirements various arrangements can be made to accomplish the desired result, such as "unit combination vacuum and pressure," etc.

Send for Catalog No. VPB-126.

MOTOR DRIVEN TYPE
For continuous duty Equipped with automatic oiler

AIR COOLED BELTED TYPE
For intermittent service Capillary oiling

WATER COOLED BELTED TYPE
For continuous service. Capillary oiling

TWO-STAGE BELTED TYPE
Equipped with automatic oiler
Highest vacuum

LAMMERT PUMPS

	Water cooled, single stage, belt driven For 27 in. vacuum at sea level							Air cooled, single-stage, belt driven				Water cooled, single-stage, belt driven capillary oiling				Water cooled, double-stage, belt driven high duty			
No.	5	5½	6	7	8	9	10	1	2	3	4	1	2	3	4	1A	4A	5½A	6A
Capacity, cu ft per min	55	67	90	180	275	425	700	3½	7	14	24½	3½	7	14	24½	3½	24½	67	90
R p m	300	300	230	185	150	120	95	500	450	400	350	500	450	400	350	500	350	300	230
Pulley, in	14x4	14x4½	16x6	24x7	28x10	34x12	46x14	4x2	6x2	9x2	10x3	4x2	6x2	9x2	10x3	4x1⅜	10x3	14x4½	16x6
Inlet and outlet, pipe size, in	2	2	2½	3	3½	4	5	½	¾	1	1¼	½	¾	1	1¼	½	1¼	2	2½
Horsepower	4½	5½	6½	12	18	28	40	⅜	¾	1¼	2	⅜	¾	1¼	2	½	3	7	9½
Floor space, in.	17x28	17x30	22x37	26x48	35x61	43x76	55x97	6x11	10x15	11x17	12x20	6x11	10x15	11x17	12x20	6x14	12x27	17x42	22x50
Shipping weight, domestic, lbs.	525	575	1000	1600	3500	6500	10800	26	80	90	170	29	85	100	185	45	245	975	1650
Shipping weight, export, lbs	650	725	1250	1950	3950	7050	11450	36	100	120	200	39	105	130	215	60	280	1200	2000

JOHN G. LAPHAM ENGINEERING CO., Inc.

Carbonic Safety System of Ice-Making and
REFRIGERATION
General Eastern Agent of the American Carbonic Machinery Co.
30 Church Street
NEW YORK, N. Y.

CO2
SAFETY
SYSTEM

PRODUCTS: Refrigerating Machinery for all Industrial Chemical Uses.

All our **Installations use the (CO_2) Carbonic Safety System.**

ADVANTAGES OF THE CARBONIC SAFETY SYSTEM OF REFRIGERATION:

Briefly the chief advantages of the Carbonic Safety System of Refrigeration are:

1. Absolute freedom from explosive and suffocating gases.
2. Low cost of operation.
3. Extremely low limit of temperatures.
4. No offensive odors or gases to endanger life or attack metals or destroy perishable goods.

SPECIAL REFRIGERATING PLANTS FOR:

Explosives and Dyestuff Manufacture.
Crystallizing Chemicals.
Chilling Oils and Cooling Liquors.
Low Temperature Drying.
Solvent Recovery.
Liquefying Gases.

DIAGRAM EXPLANATION:

Illustrated here is a complete refrigerating plant showing the relation and connections between the three distinct stages of any compression system: First, the compression (compressor A), second, the condensing (condenser B); and third, the expansion (expansion coils C). After the expansion stage the cycle is repeated.

The plant when new is charged with carbon dioxide, which is obtained in standard steel containers or drums. In these drums it is under pressure and will flow into the system by making a small pipe connection (H) between a valved opening in the suction pipe leading to the compressor and a drum of carbon dioxide.

After the plant is charged the gas confined in the system is circulated from the compressor (A) through the gas channel of the condenser (B) into the liquid receiver, from where it flows to the expansion valve (D) into the expansion coils (C) and then back to the compressor (A).

Cold water is supplied to the water tubes of the condenser, which cools the heated gas, condensing and also liquefying it. This cooled and condensed gas is collected in a liquid receiver from where it flows to the expansion valve (D) into the expansion coils (C), where the pressure is reduced by adjustment of the expansion valve. The expansion of the gas in the expansion coils (C) also reduces the temperature of the gas to a very low degree, which reduces the temperature of the air or substance in contact with the outer surface of the expansion coils, which surface may be installed directly in the refrigerator as shown, in a brine tank where calcium chloride brine is used as a transfer cooling medium, in drinking water, or for any purpose for which the refrigerating plant is to be used.

After the gas passes through the expansion coils it flows to the compressor under a low pressure and low temperature. It is again compressed by the compressor and discharged into the condenser.

Since it is necessary to maintain different pressures in the various parts of the system, gauges as shown on the Gauge Board (C) are provided to indicate the conditions of the gas and permit the operator to have the system under his control.

Any excessive oil supplied to the compressor for lubricating the cylinder is collected by oil traps (E) and (G) where the oil is drawn off through the drain cocks. The compressor is driven by any suitable motive power, either from a separate unit or driven from a line shaft.

SIMPLICITY OF OPERATION:

The Carbonic Safety System is very simple in its operation, and is unlike other compression refrigerating equipments inasmuch as it is not required to manipulate any valves other than those controlling the condensing water.

Many chemical plants, breweries, hospitals, hotels, merchant marine and battle ships are using our machine because of its non-explosive, odorless features and simplicity of operation and control. **We are always pleased to furnish catalog and detailed information on request.**

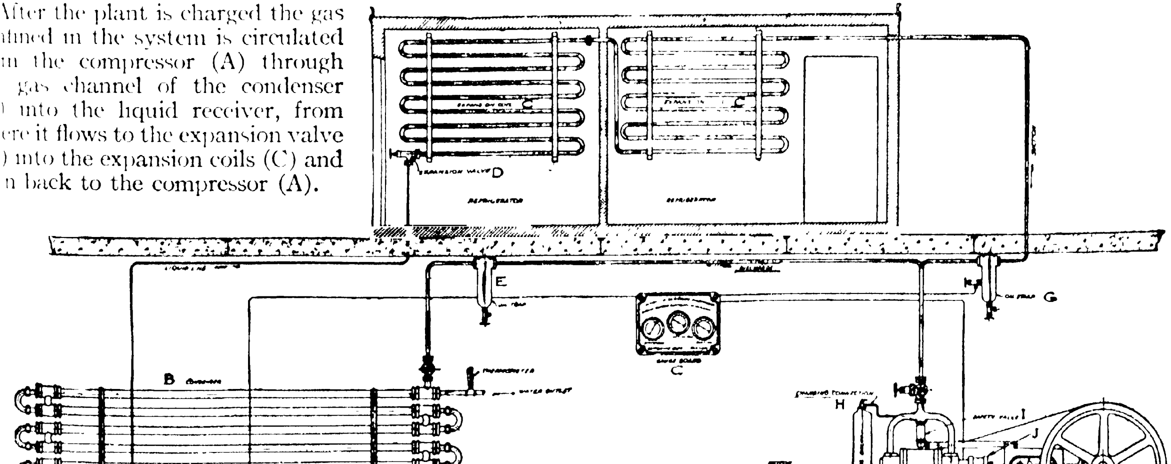


Diagram Showing Connections of a Carbonic Safety Refrigerating Plant with Direct Expansion Coils Placed in Refrigerators

LASKER IRON WORKS

Engineers, Fabricators, Erectors Steel Plate Construction

3201-3229 S. LINCOLN STREET, CHICAGO, ILLINOIS

Telephone LAFAYETTE 3700 - 3701

PRODUCTS

Light and Heavy Steel Plate Construction and Tanks for:

- Smelters
- Steel Rolling Mills
- Oil Refineries
- Sugar Refineries
- Paper Mills
- Hydraulic Power Plants
- Acid and Chemical Plants

EXPERIENCE

Lasker products are based on thirty years' intensive experience, plus modern equipment

On this firm foundation we have built our name and reputation.

The maintenance of these things necessitates that they be protected and extended with every order filled.

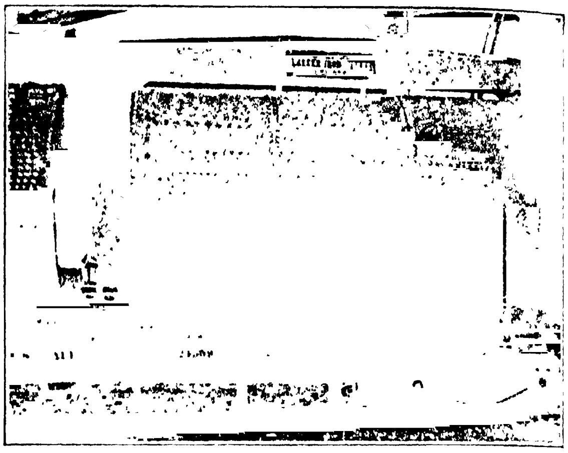
Customers are saved annoyances, delays, worry and money through this source

It means that the installation of the sturdy, economical Lasker Steel Products brings results in service, economy and satisfaction.

SERVICE

We are prepared to erect special steel plate work of any kind wherever you may be located.

As engineers, fabricators and erectors, we specialize in steel plate construction, for smelters and steel rolling mills, stills and oil refinery equipment, also hydraulic power plants, acid and chemical plants, packing houses, soap works, power plants and making o tanks for any storage use.

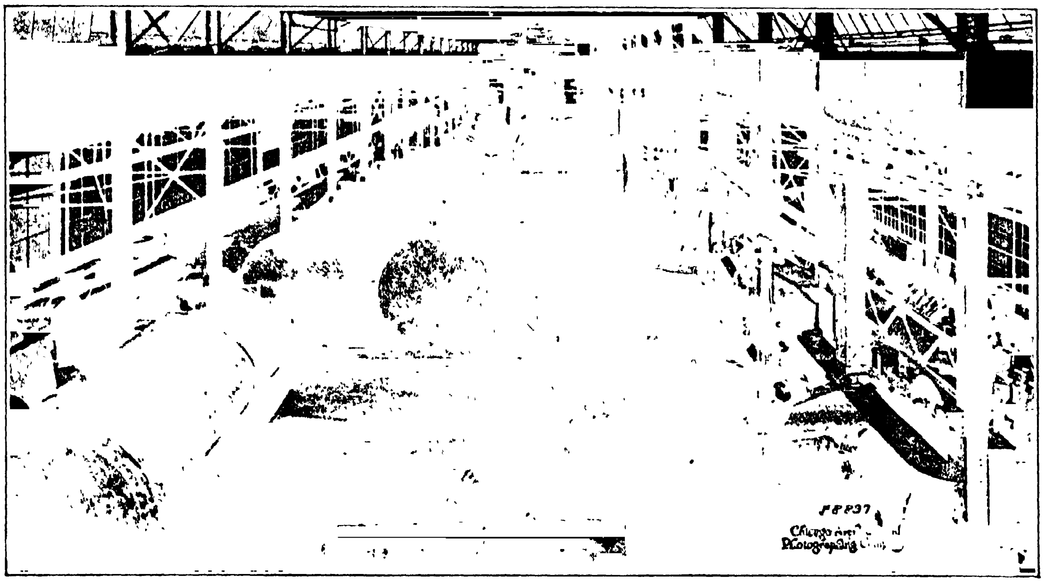


ROTARY DIP TANK AND WASHER

The scope of our operations on work of this natur covering, as they do, practically the whole Unite States, makes our service available to concerns every where who appreciate quality. Large stocks perm prompt action.

PRICES

On receipt of specifications covering your needs, w will immediately prepare and submit quotation whi will prove the economy of Lasker methods and eff ciency.



STILLS UNDER CONSTRUCTION

ROBERT L. LATIMER & COMPANY

PHILADELPHIA BRANCH OF THE CHAIN BELT COMPANY
24 AND 26 NORTH FRONT ST., PHILADELPHIA, PA.

PRODUCTS

Conveyors and Elevators for the economical handling of Chemicals, Fertilizers, Coal, Ashes, Stone, Sand and other material.

Manufacturers and designers of the Rex Traveling Water Screens, for the cleaning of intake water used in Power plants and other purposes.

Manufacturers and dealers of Rex Chain Belting, Sprocket Wheels, Elevator Buckets and Screw Conveyor. Gears, Clutches, Pulleys, Hangers, Bearings, Couplings, Collars and other Power Transmitting appliances.

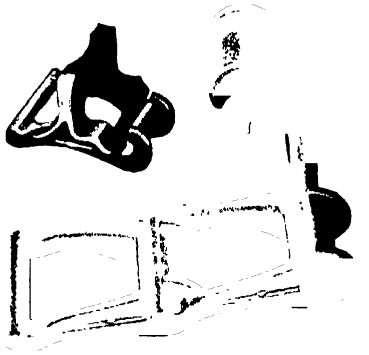
Dealers in Leather, Rubber, Cotton and Canvas Belting for the transmission of power and conveying purposes.

Dealers in Old Anchor Brand Swiss Silk Bolting Cloth and Grit Gauze, used in the bolting and grading of Chemicals, Flour, Sugar, Starch, Snuff, Soap-stone, Talc, Emery and other material.

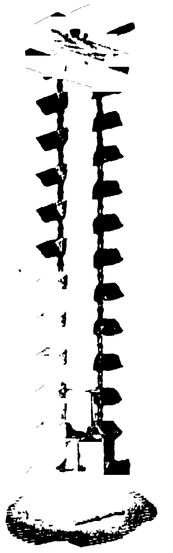
Wire Cloth of Brass, Copper, Phosphor Bronze and Steel. Perforated Metal for Grading and Cleaning purposes.

REX CHAIN

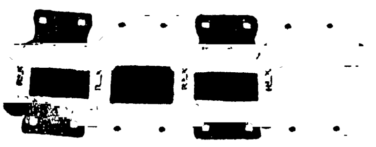
Trade Mark



REX DETACHABLE CHAIN
a distinct field where a stronger and expensive chain would not be permissi links changed in a few seconds



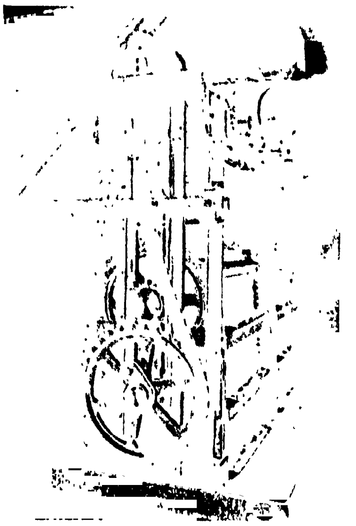
SINGLE STRAND TYPE ELEVATOR



REX COMBINATION CHAIN
is great strength and wearing qualities in cement mills, fertilizer plants, etc

REX GRIPLOCK CHAIN (RIVETED)
For driving and elevating work, especially adapted for heavy service. We can also fur this chain riveted, pin and cotters or Some numbers of this chain will on standard numbers of detachable chain sprocket wheels

BEVEL GEARS
All kinds of spur, bevel, miter and worm gearing.



REX STEEL ELEVATOR CASING
Of the most approved design. Furnished in every description

REX TRAVELING WATER SCREEN
Designed to remove foreign material from water. Removes refuse from water to be used in production of steam power or for industrial purposes requiring a large supply of clean wat . Also for removing by products from water for reclamation or to prevent contamination of waterways

BOLTING CLOTH AND GRIT GAUZE

Latimer's Celebrated Improved Old Anchor Bolting Cloth and Grit Gauze is made from the finest quality of selected raw silk, with the most careful workmanship. The threads are tightly twisted. It is uniform in meshes, exact and full count. It is free from fuzz, and of extra strength, thus guaranteeing the most durable cloth which it is possible to manufacture and insuring the most uniform product in grading all kinds of material.

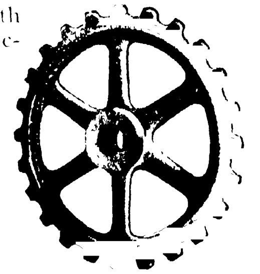
BOLTING CLOTH TRADE MARK

WIRE CLOTH

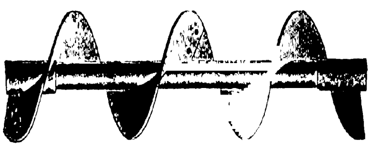
We supply wire cloth for use by the various chemical industries of whatever material and size of wire may be desired to meet special conditions.

PERFORATED METALS

Our factory is fully equipped with the latest and most improved machinery and dies for perforating metals of all kinds, and are prepared to furnish any size or style of perforation that may be required.



SPROCKET WHEELS
Made of high grade refined iron. Also furnished in semi steel, cast steel and chilled in which teeth and rim are tempered to an exceeding hardness leaving the hub of tough cast iron, easily bored and machined



STANDARD STEEL SCREW CONVEYOR
Furnished in standard and special lengths, from 4 to 18 in in diameter. Also furnished in brass or copper for use in chemical works, tanneries, etc

LEBANON BOILER WORKS

J K Petty & Co, Inc, Proprietors
MAIN OFFICE—6 S. 15TH STREET, PHILADELPHIA, PA. WORKS—Lebanon
Selling Representatives in the Principal Cities and Foreign Countries

PRODUCTS

Designers, Manufacturers and Erectors of Boilers, Superheaters, and General Plate Work.

UNIFLOW HIGH EFFICIENCY BOILER

This modern Return Tubular Boiler is patented in U. S. and Foreign Countries. Authoritative records show that after more than 50 years of universal service there are many more return tubular boilers being made for steam power purposes than any other type of boiler. It has stoically overcome all kinds of abuse

UNIFLOW RETURN TUBULAR (Circulating) vs. OLD RETURN TUBULAR (Contraflow)

A 60 in. x 18 ft. Uniflow Boiler, while working easier, will develop more horsepower than a 72 in. x 18 ft. Old Return Tubular.

The two Uniflows shown in Fig. 1 have more capacity than three Old Return Tubular Boilers of the same dimensions. The space left over is reserved for a future Uniflow, although it could be otherwise utilized.

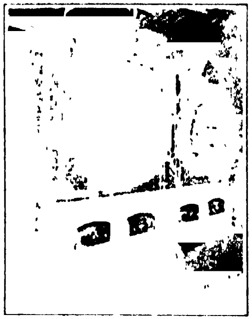


FIG 1

While maintaining the same simplicity of construction and all of the other natural and noteworthy advantages of the time honored Return Tubular type of boiler, the Uniflow, augmented with its Positive Circulation, secures more H.P. and forges way ahead in compactness, responsiveness, overload capacity, dry steaming, constant water level, efficiency, consistent design, range of sizes and adaptability—all with lower installation, maintenance and operating costs.

All Uniflow Boilers operate at 74% or higher efficiency continuously Old Return Tubular Boilers average 57% (U S. Government reports)

Uniflow Tubes are 1¼" apart --Old Return Tubulars are 1" apart

A nozzle for each tube keeps the Uniflow heating surface clean (Fig 2)

One prominent Uniflow user (a College) writes:—

"Your Uniflow setting has proved to be all that you claimed for it It is air-tight, no cracks have appeared and it is in as good shape as when first installed, despite some hard usage which the boilers have received"

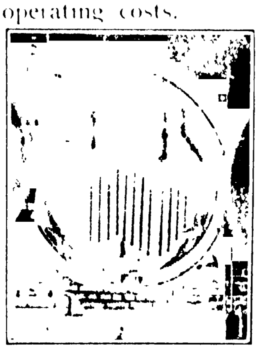


FIG. 2

HORSEPOWER RATING OF UNIFLOW BOILERS

Boiler No	Horse power	Boiler Dimensions Dia	Boiler Dimensions Len	No of 3" Tubes	Boiler No.	Horse-power	Boiler Dimensions Dia	Boiler Dimensions Len	No of 2½" Tubes
*A 1	134	60"	16'0"	96	B 3	50	36"	14'0"	47
*A 2	151	60"	18'0"	96	B 6	67	42"	14'0"	64
*A 3	155	66"	16'0"	111	B 9	75	48"	14'0"	71
*A 4	174	66"	18'0"	111	*B 12	102	54"	14'0"	100
A-5	193	66"	20'0"	111	*B-15	123	60"	14'0"	121
A 6	192	72"	16'0"	140	*B-18	153	66"	14'0"	152
*A 7	216	72"	18'0"	140	*B-21	181	72"	14'0"	181
A 8	240	72"	20'0"	140	B-24	214	78"	14'0"	216
A 9	230	78"	16'0"	169	B 27	267	84"	14'0"	272
*A 10	259	78"	18'0"	169					
A 11	287	78"	20'0"	169					
*A 12	313	84"	18'0"	206					
A-13	347	84"	20'0"	206					
A 14	386	90"	18'0"	256					
A 15	428	90"	20'0"	256					
A-16	410	96"	18'0"	293					
A-17	488	96"	20'0"	293					

* Denotes stock sizes, 150 lb working pressure, A S M E. Standard Other sizes built special

50% overload capacity guaranteed.

UNIFLOW RETURN TUBULAR VERSUS WATER TUBE BOILERS

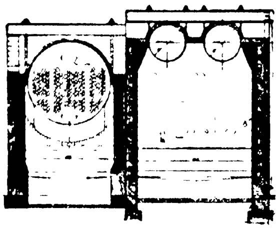


FIG 3

313 H P Standard Uniflow Boiler	300 H P Standard Water Tube Boiler

Uniflow Return Tubular Boilers are much safer than Water Tube Boilers and contrary claims misrepresent recorded facts. No multiple-ring, butt-strapped Return Tubular Boiler has ever been known to explode, as have Water Tube Boilers by the hundreds.

Uniflow Boilers cost less per horsepower installed, are cheaper and easier to operate and require much less floor space.

Uniflow Boilers excel in plain, rugged construction, accessibility for cleaning and repairs, compactness (Fig. 3) and adaptability.

Uniflow circulation is twice its height. Water Tube circulation is twice its height, plus twice its length Uniflow Boilers are more responsive, maintain a constant water level, do not prime and have no soot losses

The outside of water tubes foul with soot and fire scale (Fig. 4) which can never be effectively cleaned off. Consequently Water Tube Boilers test 71 to 74% efficient when new—but after a year's service they operate at from 48 to 65%, due to unavoidable soot losses.

Another well-known thoroughgoing Uniflow user (a Steel Works) writes:—

"We have a 500-horsepower Water Tube Boiler whose full capacity is 3 steam hammers, while our 313 horsepower Uniflow's capacity is 4 steam hammers"

FIG 4 (A very mild case)

UNIFLOW PERFORMANCE IS GUARANTEED

Uniflow saves from 15 to 25% in fuel over both Old Return Tubular and Water Tube Boilers for every year of operation after the first year. Uniflow installations comprehend high efficiency boilers—high efficiency furnaces—smokeless combustion—air-tight settings. They are well adapted to superheating.

The Uniflow stack is designed to last as long as the boiler. It is made self-supporting or guyed and requires no additional floor space.

Uniflow is a simple, standardized design, meeting all conditions of installation, such as low head room; any kind of breeching take-off, side and rear alleys not essential, etc.—but always there is more horsepower, maximum sustained economy for the life of the installation—least maintenance and lower first cost in Uniflow—The Modern Boiler.

WHY NOT PUT YOUR BOILER PROPOSITION UP TO US?

LEEDS & NORTHRUP COMPANY

Electrical Measuring Instruments

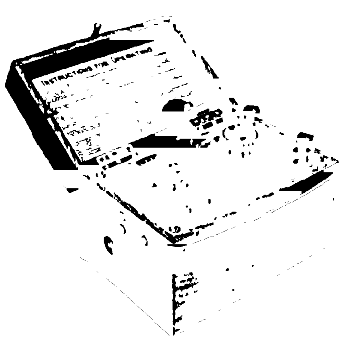
4901 STENTON AVENUE, PHILADELPHIA, PA.
1304 MONADNOCK BLOCK, CHICAGO

PRODUCTS

Scientific electrical measuring instruments, including: galvanometers; resistance, current and potential measuring instruments; potentiometers; hydrogen ion concentration apparatus; electrolytic conductivity apparatus; indicating, recording, signalling and controlling pyrometers of the potentiometer type; optical pyrometers; etc.

POTENTIOMETER PYROMETERS

The potentiometer pyrometer embodies the principles of the precision potentiometer in a form suitable for industrial use. It is free from all errors due to resistance of couples or lead wire, and errors due to the cold junction temperature. Ranges up to 2000° F. for base metal couples, and 3000° F. for noble metal couples. If the instrument is calibrated in millivolts, it may be used with any type of thermocouple irrespective of the length or cross-section of the thermocouple wires. The accuracy is guaranteed to ½% of the range.



INDICATING POTENTIOMETER

Indicating—The portable type indicating potentiometer measures 9½" x 6" x 6" and weighs 9 lbs. It is well suited for use as a checking instrument and for any special or investigational work.

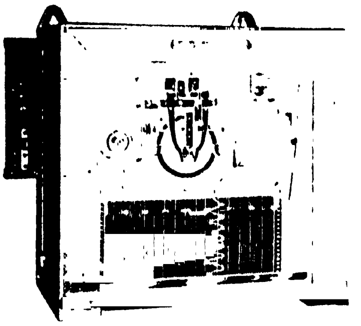
The wall type indicating potentiometer, for permanent installation, is contained in a cast brass dust-proof case, either dull black or nickel plate finish. A selector switch may be used with these instruments when measuring several couples from the same station.

Recording—The recording potentiometer is a rugged machine driven by an electric motor. Motors furnished for 110 volts A. C. or D. C., or 220 volts D. C. The chart is 10 inches wide, giving a clear open scale, and moves forward at the rate of 3 inches per hour. The recorder permits the attachment of contact making mechanisms so that it will give automatic signals, or will control automatically.

PHYSICO-CHEMICAL METHODS IN INDUSTRY

Measurement of hydrogen ion concentration and measurement of electrolytic conductivity are two methods of physical chemistry which have come into general use in connection with the control of industrial processes which depend upon a knowledge of the chemical composition of liquids containing substances in solution. The Leeds and Northrup line of apparatus embraces several types of equipments for the application of these methods.

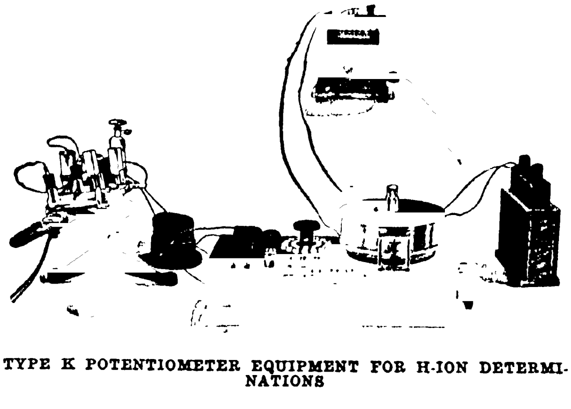
For Hydrogen Ion Measurements—Four equipments are available: (1) the type K potentiometer equipment for research and laboratory work requiring the highest precision of measurement; (2) a less expensive equipment for general laboratory work and process control; (3) portable hydrogen ion potentiometer, similar in appearance to the indicator shown on this page; (4) the hydrogen ion recorder, similar to the recorder shown, which gives continuous indications and which will operate alarm or signalling devices.



RECORDING POTENTIOMETER

For Conductivity Measurements—Six equipments are available: (1) a precision equipment with which measurements can be made to .001% ; (2) a less elaborate equipment for general laboratory work; (3) an equipment for general laboratory work which can be operated on an A. C. lighting circuit; (4) a portable conductivity bridge also operated on a lighting circuit; (5) an indicator to mount on the wall, which can be used with a selector switch to measure conductivity at several different points; (6) the conductivity recorder, which resembles the recorder shown.

Types of Installation—Hydrogen ion equipments have been employed in connection with the carbonization of beet sugar juice, the neutralization of glucose liquors, the fermentation of molasses, the tanning of leather, the chemical treatment of textiles, and others involving knowledge regarding the acidity or alkalinity of solutions; while the conductivity equipments have been used in measuring boiler water concentrations, detecting surface condenser leakage and tail race losses, determining the time to finish the condensation of milk, measuring the concentration of acidity, and others in which knowledge of change in chemical condition is essential.



TYPE K POTENTIOMETER EQUIPMENT FOR H-ION DETERMINATIONS

W. K. Lewis William Green W. H. McAdams R. G. Knowland

LEWIS, GREEN, McADAMS AND KNOWLAND

Chemical Engineers

66 BROADWAY, CAMBRIDGE, MASS.

OUR SERVICE SUPPLEMENTS THE CLIENT'S FACILITIES

We are equipped to conduct necessary research work for developing new and improved processes, and then to furnish specifications and design plant and equipment for carrying on such processes on a commercial scale. Where our clients have plant laboratories, we work with or direct work on any special problem in their own laboratory, or carry it on in our laboratory as may be desired.

MANY CLIENTS OUTSIDE OF CHEMICAL FIELD

Our work is largely with manufacturers whose business is not essentially chemical, but in whose processes we have been able to reduce or recover wastes, make possible a greater uniformity of product, or to lower the losses due to rejections. We have often been able to cooperate in the commercial development of ideas put forward by the manufacturer's organization.

EXCLUSIVE POLICY A SAFEGUARD TO THE MANUFACTURER

Only one retaining client in any given line will be accepted by this firm. Thus, we are able to establish the confidential relation that must exist for the best results, and at the same time be sure that no information will leak to competitors. The whole strength of our diversified organization is at all times available to the client, with no divided allegiances or delicate situations, such as are bound to arise where such a strict rule is not followed.

REFERENCE TO ACTIVE CLIENTS

We are prepared to undertake any work in the general scope of chemical engineering and our experience has included the lines mentioned below. W shall be pleased to refer those interested in the na and quality of our work to clients who can inform th at first hand as to the satisfaction they have had w our service.

SPECIALIZED EXPERIENCE IN THE FOLLOWING LINES

The following are indicative of undertakings in which we have rendered service.

The technical development of a nationally advertised automobile brake-lining from the raw material to the finished product.

A process for flash-proofing cotton fabrics, which removed a fire risk which was a serious drawback to their sale and use.

The drying of food products to prevent deterioration losses due to uncontrolled reduction of their moisture content.

The tunnel drying of sole leather.

A process for dyeing oil-tanned leather, without the use of dusts as employed in all processes hitherto.

Installation of equipment preventing losses of valuable solvents.

Design and erection of special dust collecting apparatus.

The design of many types of special purpose driers, and their installation and tuning up for maximum efficiency.

The inspection of municipal water supply and public utility systems.

The introduction of methods for producing extra heavy, but controlled, impregnation of roofing materials with asphaltic mixtures.

Engineering reports to financial interests in regard to firms in which they are concerned. Reports on possibilities of new projects.

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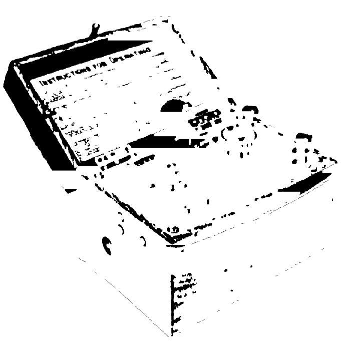
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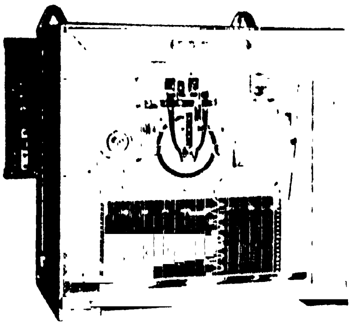
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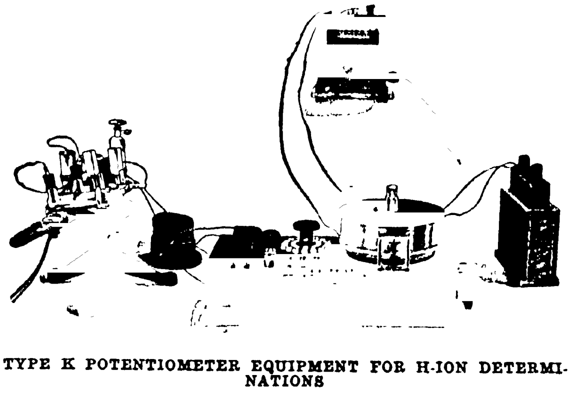

TYPE K POTENTIOMETER EQUIPMENT FOR H-ION DETERMINATIONS

LIBERTY COPPERSMITHING CO.

Coppersmithing Engineers
1708-16 North Howard Street
PHILADELPHIA, PA.

NEW YORK OFFICE
10 Hanover St

PLANT
1708 16 N Howard St
1709 17 Waterloo St
Philadelphia, Pa

PRODUCTS

Of Copper, Aluminum, Brass, Iron, Steel, Silver, Monel Metal or Lead.

- Autoclaves
- Alcohol Apparatus
- Aluminum Linings
- Block Tin Linings
- Coils, All Kinds
- Coolers and Heaters
- Condensers
- Clarifiers
- Copper Pipe Lines
- Defecators
- Evaporators
- Extractors
- Extracting Batteries
- Heat Exchangers
- Jacket Kettles
- Kettles
- Lead Linings
- Milk Evaporators
- Pans, Vacuum
- Pressure Kettles
- Revolving Pans
- Separators
- Stills
  - Vacuum
  - Pressure
  - Continuous
  - Rectifying
  - Fractionating
- Silver Linings
- Tanks
  - Copper
  - Brass
  - Monel Metal
- Mixers

We manufacture special or standard apparatus to clients' specifications for the following plants:

- Breweries
- Chemical
- Candy
- Dye
- Distilleries
- Edible Oil
- Food Products
- Logwood
- Malt Extract
- Milk Condenseries
- Pharmaceutical
- Paper and Sulphite
- Sugar Houses
- Tanneries
- Vinegar

FACILITIES

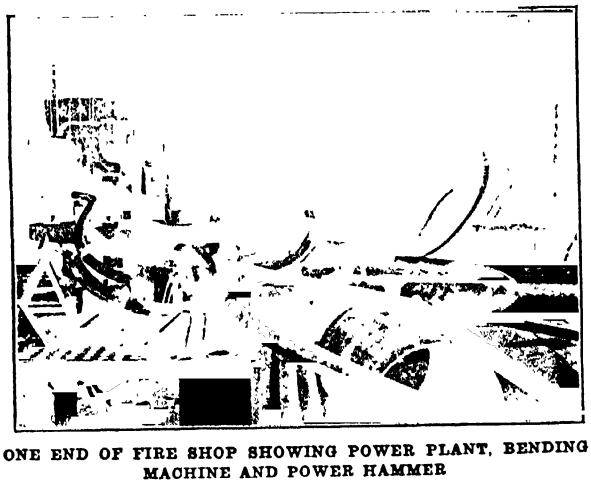
The fact that the organization is composed of s. master coppersmiths and all castings are carefully machined to gauge enables us to build to advantage any of the above equipment in our own shops, insuring proper fit and workmanship, as all parts and machines are erected and piece marked and thoroughly inspected before leaving our plant.

SERVICE

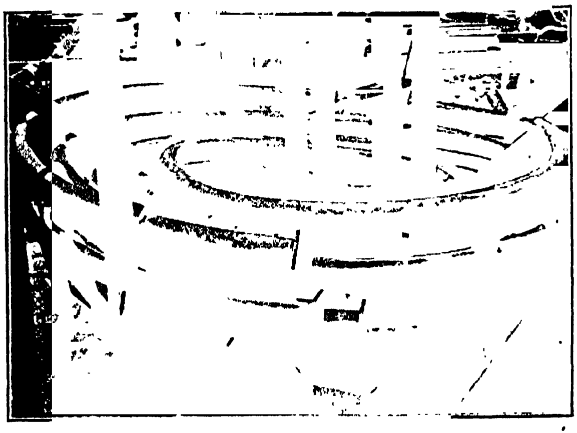
From the long experience of years of the members of the company and their organization in building all types of chemical equipment they will be pleased to assist in the design when fundamental errors have been detected and cooperate with their clients that the apparatus may be executed more economically.

INQUIRIES

We solicit your inquiries and will be pleased to furnish quotations, specifications and drawings upon request.



ONE END OF FIRE SHOP SHOWING POWER PLANT, BENDING MACHINE AND POWER HAMMER



PORTION OF COILS FOR 13 FT. DIAM. COIL PAN IN PROCESS OF ASSEMBLY

LINK-BELT COMPANY

Manufacturers of

Elevating, Conveying and Power Transmission Machinery and Accessories

PHILADELPHIA CHICAGO INDIANAPOLIS

BRANCH OFFICES AND AGENCIES

New York 299 Broadway
[illegible] 49 Federal Street
Pittsburgh 1501 Park Building
St. Louis Central National Bank Building
Buffalo 547 Ellicott Square
Wilkes-Barre 2nd National Bank Building
[illegible] 429 Kirby Building

Detroit 1210 Woodward Avenue
Kansas City Mo 306 Elmhurst Building
Seattle, 820 First Avenue S
Portland Ore., First and Stark Streets
San Francisco 168 Second Street
Los Angeles 163 N Los Angeles Street
Denver Lindrooth Shubart & Co., Boston Building

Louisville Ky Frederick Wehle Starks Building
New Orleans, C O Hinz 504 Carondelet Building
Birmingham Ala S L Morrow 720 Brown Marx Building

In Canada Canadian Link Belt Co., Ltd., Toronto and Montreal
H W Caldwell & Son Co., Chicago New York Dallas Texas

PRODUCTS

Elevators and Conveyors for all materials; Coal and Ashes Handling Machinery; Screens, Crushers, Feeders, Water-Intake Screens; Locomotive Cranes; Coal Storage Systems; Grab Buckets; Elevator Buckets; Chains, Gears, Sprocket Wheels; Transmission Machinery, Silent Chain Drives; Steel Roller Chains; Belt Conveyors, Bucket Carriers, Screw Conveyors, Electric Hoists; Portable Loaders, Car Unloaders.

ELEVATING AND CONVEYING MACHINERY

The usefulness of Link-Belt Elevating and Conveying Machinery and its adaptability to a wide range of industries is evident to anyone who observes what is going on in all lines where materials are handled from one place to another. Its use benefits both employer and employee alike, under modern economic conditions.

The intensive production which characterizes the automobile industry, for instance, has been made possible by well-planned conveyors and elevators. Willys-Overland, Ford and other cars are assembled on continuously-moving conveyors, piece by piece being added by the assemblers at stations along the course of the conveyor. Frame after frame moves through the assembling room at a rate which allows proper time to make the various additions. Everything is planned to secure the highest efficiency mechanically, with the greatest convenience and least strain for the men. This same plan is being applied to other industries today, with the same success.

One important reason for the efficiency and popularity of modern conveying machinery for moving material in bulk (coal, stone, gravel, etc.) is the fact that the process is continuous; a steady stream of small quantities handled by the rapid succession of conveying flights or buckets, transports a large amount of material in a day, although the machinery used requires but small space and little power for operation. Loading and discharging are automatic, reducing operating expenses to a minimum.

A list of the lines of industry in which Link-Belt machinery is employed comprises practically the entire line of industrial activity, because wherever labor is used, there is a type of Link-Belt product which makes that labor more effective—and more contented.

Link-Belt equipment is always built to fit the conditions. Practically every handling problem is different, requiring individual attention and study.

By that, however, we do not mean that there are no standard Link-Belt machines. We have many, such as our locomotive cranes, electric hoists, portable loaders, etc., etc., which are recognized standard types of machines the country over. Such machines often form part of a larger general plan.

The question to determine is: what plan will accomplish the results you wish to obtain with the greatest effectiveness and economy.

It is not practicable for us to give information in this publication which would enable you to pick out such machinery as you might feel would solve your problem. It is to your advantage, as well as to ours, to let our experienced engineers study your problems and recommend conveying equipment which will accomplish your results in the most economical way. We make no charge for advice, layouts or estimates.

Our experienced engineers are prepared to give prompt service in the solution of elevating and conveying and power transmission problems based on our years of experience in this work.

Write for General Catalog No. 300 which illustrates and describes the entire Link-Belt line, and tell us about your problems.

ARTHUR D. LITTLE, INC.

Chemists—Engineers—Managers

Charles River Road
At Kendall Square
CAMBRIDGE, MASS.

SERVICES

Thirty-five years of experience in the application of chemistry to industry means an accumulated knowledge of unusual value to clients. That is our record. A staff of over eighty persons with a capacity for service which is unexcelled is at your command. **Service** is our watchword. Some opportunities for helpfulness and profit to you may be suggested by the following brief outline.

Industrial Research—Development of new and better methods, new products and new opportunities for profit. In short, the betterment of industry by the application of chemical methods.

Engineering—Design, construction, and operation of plants where chemical principles are involved, such as Pulp and Paper, Naval Stores, Wood Distillation, Cement, Ceramics, Phosphates, Sugar, Starch, etc.

Process Control—Improvement and standardization of output by scientific control.

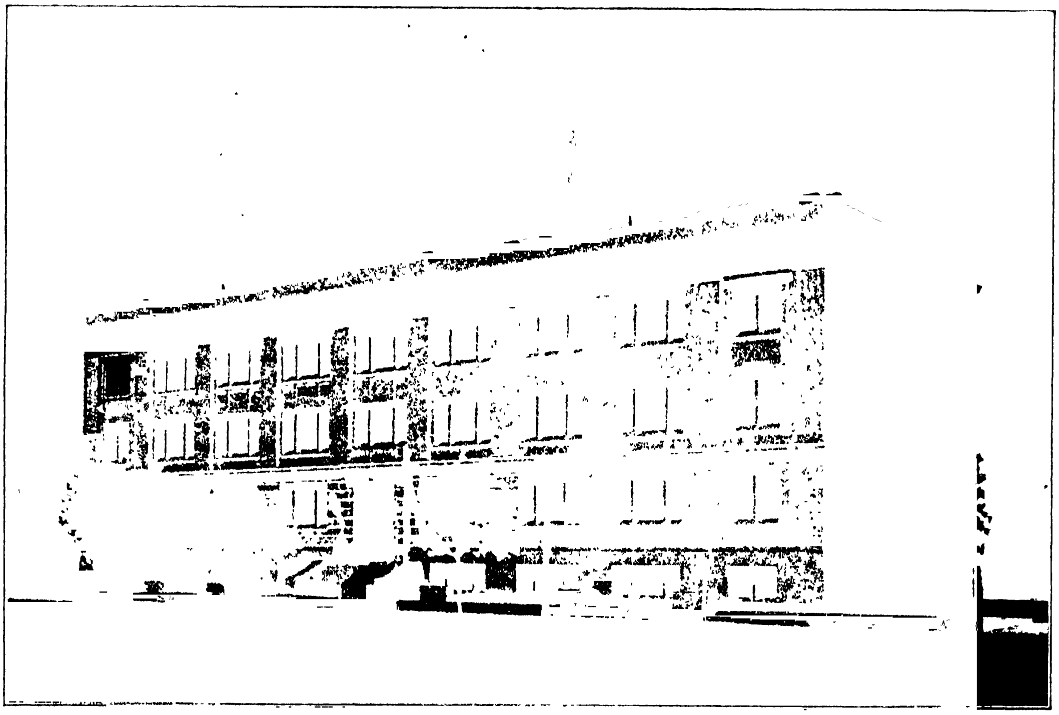
Technical Reports—Prepared for Bankers, Investors, Manufacturers, etc., to assist in determining the status of existing industries and the soundness of industrial proposals; advice on new processes, new products, efficiency of equipment and of operating plant, waste utilization, etc.

Industrial Surveys—Studies of the natural resources of defined territories and development of industries of sound economic justification.

Control of Materials—Analyses and physical tests of all kinds.

Management of Production—A climax of real chemical service which is often the keystone of success. The actual management of processes in the plant until effective and profitable results are assured.

Contract Service—A service which amounts to the addition of a score of highly trained technologists to the organization of the manufacturer, available for continual advice and consultation.



INDUSTRIAL RESEARCH LABORATORIES OF ARTHUR D. LITTLE, INC.

LONG ISLAND FOUNDRY CO., INC.

Manufacturers of

Grey Iron Castings

11TH STREET NEAR VERNON AVE., LONG ISLAND CITY, N. Y.

PRODUCTS

Chemical Castings for all purposes. Also special castings made to specifications such as,

- Furnace Castings
- Retorts
- Caustic Pots
- Machinery Castings of every description

FACILITIES

Equipped with traveling cranes, most modern foundry machinery and housed in an all-daylight modern foundry building, this plant is equipped to turn out castings of the highest service at a reasonable cost. Our facilities are excellent for shipping to any part of the country as all the trunk railroad terminals are within easy reach.

GREY IRON CASTINGS

We are prepared to turn out a high grade of Grey Iron Castings for any form of chemical or industrial equipment.

We will be pleased to estimate on drawings submitted to us by chemical engineers and other designers of machinery.

Our manufacturing facilities enable us to undertake the production of castings of any weight up to and including 5 tons. Thus we can turn out satisfactory large castings for evaporators, condensers, stills, retorts, all kinds of flanges, valves, manifolds, parts of mills, crushers, filter-presses, etc.

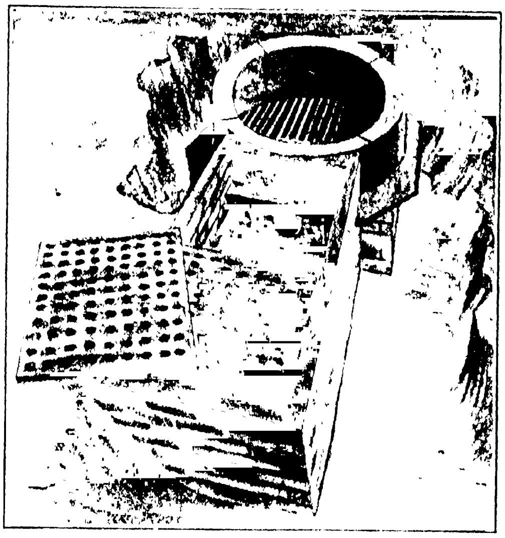
The quality of our castings is of the very best. Our iron is selected by test, and all stages of our manufacture are in the hands of expert foundrymen.

In addition to constantly endeavoring to preserve the high quality of our castings, we make a special point of giving satisfactory service to our customers. You may submit us your designs for estimates in the confidence that our terms and deliveries will be right.

OUR SPECIAL CAST-IRON FIRE-BRICK FURNACE

We have designed and built this special furnace for heating any kind of kettle, or other chemical equipment. It does not require any fire brick or refractory lining of any kind, thus eliminating expensive brick settings and renewals, besides being an economy in first cost and upkeep of the heating unit.

This furnace is designed for use in varnish and chemical works.



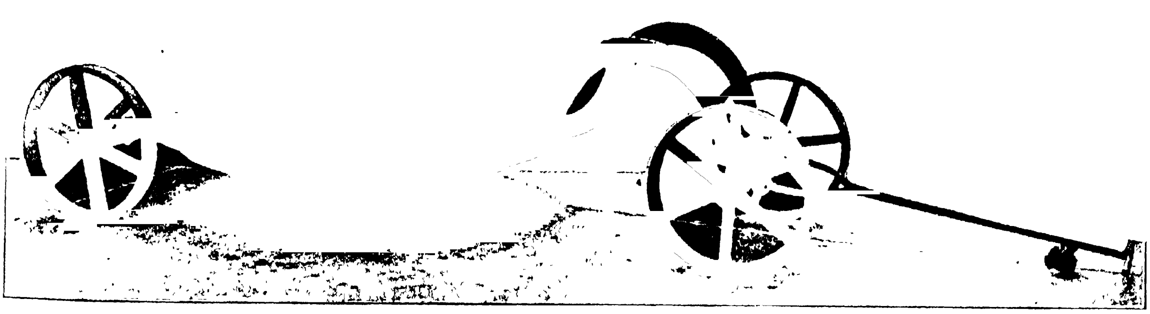
SPECIAL CAST IRON FIRE BRICK FURNACE

OUR CAST IRON VARNISH KETTLES

These kettles are built in a number of sizes for boiling varnish. They are rugged and sturdy castings.

They are not a sweep casting but are specially built from a pattern. The thickness at the bottom is increased to withstand high heat, expansion and other strains.

These kettles are molded and cast bottom down, thereby insuring a clean casting, at the part where it is subjected to the greatest heat and wear.



CAST IRON VARNISH KETTLE WITH TRUCK

LOUISVILLE DRYING MACHINERY COMPANY

MANUFACTURERS OF EVAPORATORS, DRYERS AND PRESSES

LOUISVILLE, KY.

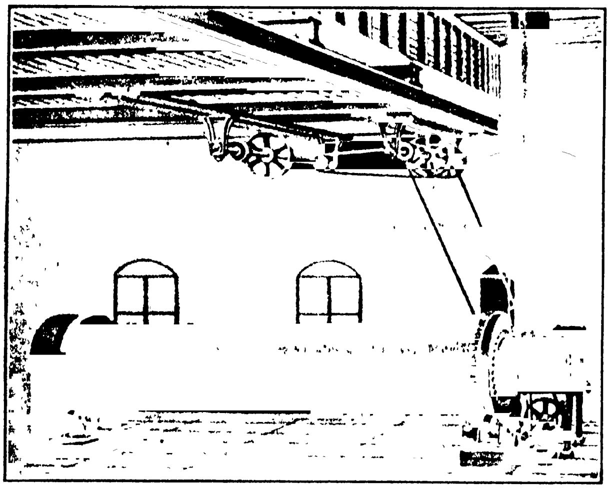
PRODUCTS: Rotary Dryers, both Steam and Fire; Tankage Dryers, Meal Dryers; Continuous Filtering Machines for pressing Starch Feeds, Brewers' and Distillers' Spent Grains.

Sugar Granulators and Coolers; single and multiple Effect Evaporators; Vacuum Pans; Salt Extractors.

LOUISVILLE DRYERS:

The various types and styles of our Dryers are applicable to any materials that can be dried in a Rotary Dryer.

The Fire Dryers for materials that are not injured by the gases from the furnace and can stand great heat are of the counter current type.



DIRECT STEAM DRYER

Fire Dryers: Where the materials are not injured by too much heat the heat and materials travel in the same direction. Where the furnace gases are injurious to the materials, we manufacture Indirect Heat Fire Dryers. These Dryers are manufactured in all sizes from 38" to and including 6' and any length desired. The Fire Dryers are used on any non-combustible materials that must be dried.

The Steam Dryers are for live steam and are built to stand a pressure of 100 lbs. Tubes extend through the entire length and the dryer is relieved of the condensation scientifically and continuously which gives it a capacity much greater than the other types. The dryer is made in all sizes from 38" to 72" in diameter and with tubes from 15' to 25' long. The dryer is used on all combustible materials principally for feeds and food and especially Hay, Apple Pomace, Starch, Brewers', Distillers' and kindred feeds, damp grains, tankage and materials that would be discolored by too much heat and which can be dried on a rotary dryer.

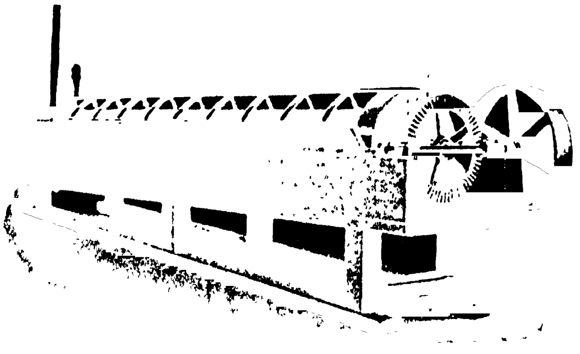
The Sugar Granulators are Indirect Rotary Dryer. The heat is supplied by a steam battery and they are made in sizes from 1500 lbs. to 150,000 lbs. of sugar per day. The dryer is used for all materials that cannot stand a heat above 200 and which can be dried in a rotary dryer. The dryers are lined with wood and all iron which comes in contact with the material is covered with copper for materials that are affected by coming in contact with iron.

SINGLE AND MULTIPLE EFFECT EVAPORATORS:

We build these of the standard vertical type. They have a large circulating tube in the center. The different sizes range from twenty-four to seventy-two inches in diameter and of any height desired.

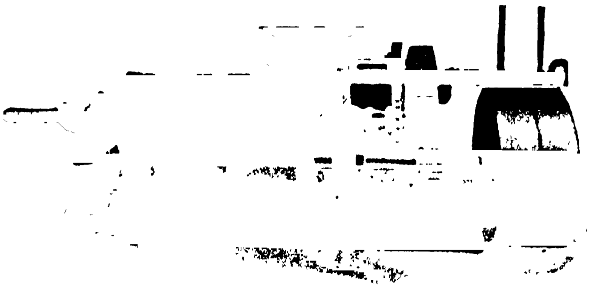
VACUUM PANS:

These are of the coil type and range up to and including seventy-two inches in diameter.



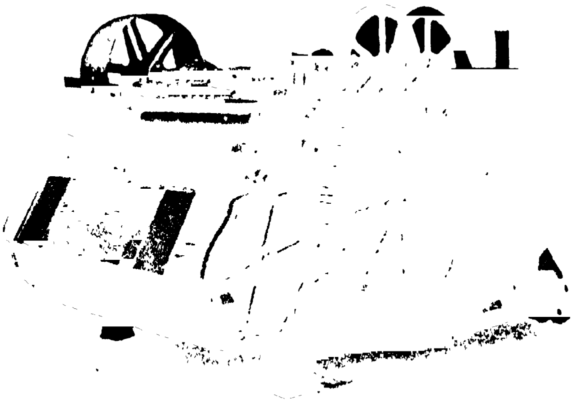
MEAL DRYERS:

The Meal Dryers are of the Rotary type with steam pipes running the full length. This dryer is intended for meals, small grains and similar materials that would scorch if permitted to lie on hot pipes.



THE EXPELLER:

This machine is for extracting the excessive moisture in many different materials and is intended to supply the demand where a cheaper filtering machine is wanted than the Continuous Filtering Machine. It is also continuous in its operation.



CONTINUOUS FILTERING MACHINES:

Continuous Filtering Machines are intended to extract the moisture from glucose, starch feeds, brewers' spent grains, distillers' slops and kindred materials, which contain too much moisture to go direct into the dryer.

The principle is a perforated sectional metal belt passing between rolls. The material from which the excessive moisture is to be extracted is fed in here on the perforated belt and carried between the rolls. The machine is continuous in its operation.

LOVE BROTHERS INCORPORATED

Founders and Machinists

AURORA, ILL.

PRODUCTS

We Build to Blueprints and Specifications Any Appliances or Machines, in Iron, Steel or Bronze.

Acid Pots and Pans

Acid Resisting Castings

Bone Black Kilns

Brass and Bronze Castings

Castings for:

- Acid Manufacture
- Lead Works
- Plate Glass Manufacture
- Zinc Works, Etc

Castings for Starch and Sugar Mills

Chemical Castings

Filter Presses and Filter Press Parts

Gray Iron Castings

Hard Iron Castings

Heat Resisting Castings

Lead Pots and Pans

Machine Shop Work

Niter Boxes

Pattern Work

Retorts

Rubber Machinery

Screw Conveyors

Special Alloyed Iron for:

- Ash Conveyor Parts
- Grinding Parts
- Liners for Grinding Mills, Etc.
- Welded Steel Products

LOCATION AND FACILITIES

The location of the works of this company at Aurora, Ill., is especially good for receiving raw materials and for shipping to all parts of the United States, as it has prompt connections with all trunk line railroads in all directions.

MANUFACTURING FACILITIES

The manufacturing facilities of this company include

A large, well equipped pattern shop

Modern machine shops with ample tool and crane capacity.

Foundries with capacity to take care of castings up to ten tons in weight.

The Foundries are experienced in making gray iron castings of all grades and analysis, also in all types of chilled iron, white iron, and hard alloyed iron castings.

WELDING DEPARTMENT

Equipment, stock of material, and experienced operatives are available for the manufacture of complete installations of welded steel products, especially in connection with the building of watercooled parts for all classes of steel furnaces, heating furnaces, annealing furnaces, etc.

Inquiry is invited along the lines of the products listed herein, and as to foundry and machine shop work in general, not only for complete machines, but for special orders.

Prompt attention and satisfactory deliveries are given to orders of a jobbing character.

The superior character of Love Brothers' castings is known throughout the United States, and the machine work is likewise generally commended by hundreds of satisfied customers, whose repeated orders have proved even more strongly than any verbal testimony that they know where they receive satisfactory attention and really good work.

THE LUDLOW-SAYLOR WIRE CO.

Manufacturers of

"The Perfect" Double Crimped Wire Cloth and Rek-Tang Rolled Slot Screens

ST. LOUIS, MO.

BRANCH OFFICES

Chicago Salt Lake City El Paso

PRODUCTS

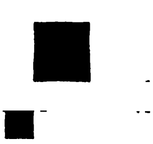
Double Crimped Wire Cloth and Rek-Tang Rolled Slot Screens in all commercial metals for all purposes.

We specialize in wire screens for the Mining Industry.

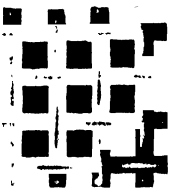
DOUBLE CRIMPED WIRE CLOTH

Years of experiment and experience have given to Ludlow-Saylor products an unqualified superiority over all other grades of wire cloth.

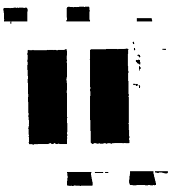
In the weaving of the "Perfect" Double Crimped Wire Cloth, each wire supports and strengthens every other wire, the shoot wires being arched over and under the warp wires, and the warp wires arched over and under the shoot wires, thus forming a mesh that is absolutely and permanently rigid, eliminating all possibility of wires slipping and insuring an evenness of the screened product. And the wires are not bent but **Crimped,** not with sharp angles, but curved gradually and gracefully over and under the intersecting wires, without any rough corners. Thus the full strength of each wire is retained and its surface kept smooth and unbroken. All strain is equally distributed over the entire screen, and the openings remain uniform and equal as long as there remains enough metal to sustain the weight of the material to be screened.



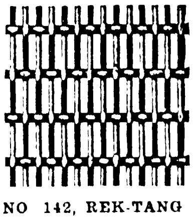
2 MESH, NO. 8 .162 WIRE



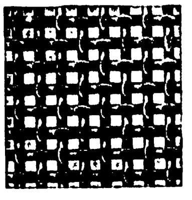
4 MESH, NO. 12 .105 WIRE



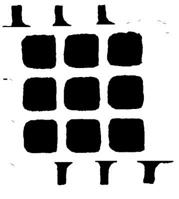
NO. 32, REK-TANG



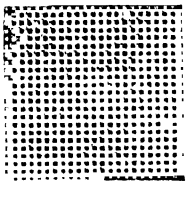
NO 142, REK-TANG



8 MESH, NO. 16 .063 WIRE ROLLED



4 MESH, NO. 18 .047 WIRE



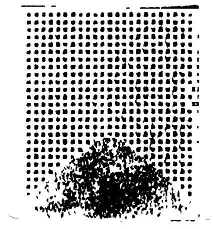
22 MESH, NO. 24 .023 WIRE

REK-TANG ROLLED SLOT SCREENS

A Significant Comparison—The Lesson of Experience.

The three illustrations shown below tell a very strong story of the marked superiority in "Producing Power" of **Rek-Tang Rolled Slot Screens.**

REK-TANG



SQUARE MESH

PERFORATED METAL

They show the relative discharging capacity (producing capacity) in a given time of equal areas of (1) **Rek-Tang,** (2) Square Mesh, and (3) Perforated Metal.

They show that the production goes rapidly down hill in the order named, with **Rek-Tang** having a 50% to 100% greater productivity than Perforated Metal.

This comparison is based on actual commercial tests, and proves conclusively the superiority of **Rek-Tang** Screens.

ORDER CAREFULLY

Be sure and give full information when ordering wire cloth. Don't forget to give: Number of rolls, or number of pieces; length and width of each piece or roll; mesh; decimal size of wire and material from which cloth is to be made.

DELIVERY

Our central location and tremendous capacity assure the promptest delivery of your orders.

WRITE FOR OUR CATALOG

THE LUZERNE RUBBER COMPANY

Manufacturers of Hard Rubber Products

TRENTON, NEW JERSEY

CHICAGO OFFICE: 564-570 W. Monroe St.

PRODUCTS

Hard Rubber Pipe, Fittings, Buckets, Funnels, Agitating Spiders, Tank Car Strainers, Nitroglycerine Skimmers, etc.

Hard Rubber Sheet Rod and Tubing.

All Hard Rubber Moulded products for Chemical or Electrical use.

Hard Rubber Automobile Accessories—i. e.: Storage Battery Jars, Radiator Caps, Lever Balls, etc.

Fountain Pen Material and Hard Rubber for all particular Hand Turning; Drug Sundries.

Hard Rubber for Water Meters.

HARD RUBBER FOR HANDLING CHEMICALS

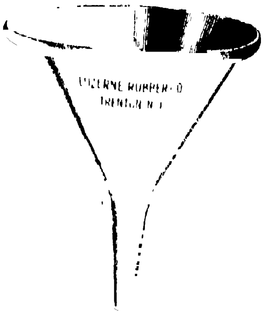
The Luzerne Rubber Co manufactures pipe and fittings and special articles of tough and durable stock especially designed to withstand the action of chemicals Pipe and fittings are supplied in all sizes from ¼ inch up This material is recommended for use with Acetic, Citric, Hydrochloric, Nitric and Sulphuric Acids Caustic Soda and Potash, and most acid or alkaline solutions which corrode metals or other materials All fittings are furnished with Standard Iron Pipe Thread Pipe, plain or threaded

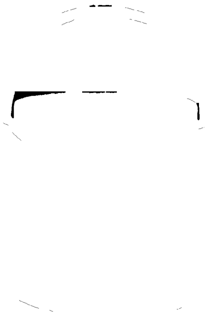
Send us your blue prints of assembly and we will gladly quote on furnishing material ready for installation Buckets are supplied in 1, 1½, 2, 3, 4, and 5 Gal Capacity, with or without spouts Pipe flanges threaded or vulcanized on pipe

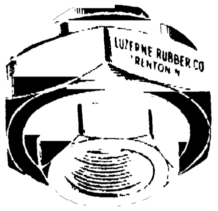
Hard Rubber while extensively used in the Chemical Industries is by no means limited to this line

It enters into the manufacture of hundreds of articles in as many different lines of work, each demanding a material especially adapted to its requirements This condition places on the market many different grades of Hard Rubber Among the products of the Luzerne Rubber Company is a grade of Hard Rubber suited for your purpose and samples will be submitted upon receipt of advice, stating the purpose for which the material is to be used

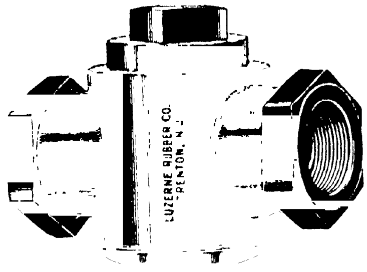
Estimates submitted on any Hard Rubber articles In requesting estimates on specialties, be sure to specify accuracy and finish required, giving all information possible


FUNNEL

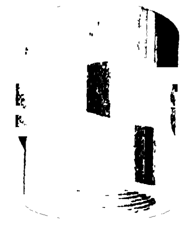

BUCKET

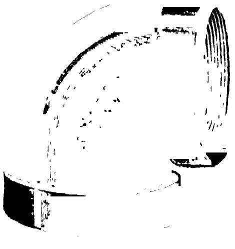


UNION

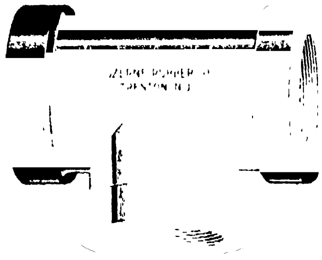


PLUG COCK


COUPLING


ELBOW

STRAIGHTWAY COCK


TEE

THE WALTER E. LUMMUS COMPANY

Manufacturers of

Distilling, Condensing, Evaporating and Extracting Machinery
Builders of Chemical Works and Refineries
173 MILK STREET, BOSTON, MASS.
WORKS EVERETT MASS

PRODUCTS

- **Complete Plant Installations:**
  - **Industrial Alcohol and Ether.**
  - **Beverage Dealcoholization.**
  - **Wood Distillation; Methanol, Turpentine.**
  - **Acetone and Acetic Acid.**
  - **Formaldehyde.**
  - **Tannins, Resin and Oil Seeds Extraction.**
  - **Solvent Recovery.**
  - **Gas By-Products; Benzol, Toluol.**
- **Standard Equipment:**
  - **Continuous and Periodic Stills and Rectifiers.**
  - **Vacuum Stills and Evaporators.**
  - **Extractors and Dissolvers.**
  - **Gas-Vapor Absorbers and Scrubbers.**
  - **Condensers and Heat Interchangers.**
  - **Standard Accessory Equipment.**

ORGANIZATION AND FACILITIES

The Walter E. Lummus Company is a Massachusetts Corporation. It owns and operates a factory at Everett, Mass., with ample facilities for the construction, assembling, and testing of all the principal types of apparatus manufactured by the company. In addition to its own plant the company has favorable connections with reliable foundries, machine shops, and sheet metal working establishments in the U. S. and Canada providing elastic capacity for extra business. This arrangement enables the company to handle extensive undertakings in plant construction with minimum cost and delay.

The experience acquired by twenty-eight years of continuous activity in the design and construction of chemical plant is available to our customers together with a vast accumulation of information pertaining to the various chemical and related industries which it is intended to serve.

ASSEMBLY AND TESTING FLOOR—P103

INDUSTRIAL ALCOHOL AND ETHER

Alcohol Distilleries—The increased demand for alcohol for industrial and power purposes offers the prospect of profitable manufacture from materials hitherto considered unavailable; and also distilleries have become practical in localities which, though possessing cheap materials, were formerly considered too remote from market. The materials that have become available by reason of the increased price and wider use of alcohol are diverse, including: molasses, cane juice, fruit juices, sago palm, sorghum, raisins and other dried fruits, waste liquors of sulphite paper pulp manufacture and the alcohol produced as a by-product in the manufacture of non-alcoholic beers and wines.

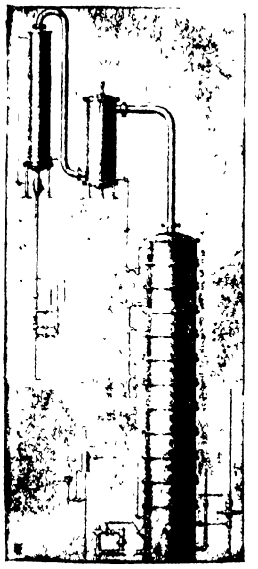
We are prepared to furnish complete fermenting and distilling equipment for large central distilleries equipped with modern economical apparatus, and likewise to provide the simpler and less expensive apparatus adapted to the requirements of plantations and rural distilleries.

Fermentation plant for grains and starchy materials—We provide elevating and milling machinery, cooking and malting equipment, pure yeast apparatus, fermenting tubs, tanks, and all necessary vessels, pumps, mash coolers, and attemperating coils according to the governing conditions.

For molasses, sugar and fruit juice distilleries—Fermenting equipment includes pure yeast apparatus, acid tank, fermenting tubs with or without attemperating coils, pumps, and all necessary accessories favorable to high conversion of sugar content.

Lummus Continuous American Type "Beer" Stills—Especially adapted to the economical separation of alcohol from fermented mashes and "beers" of low alcoholic strength, and their concentration to 120° to 160° proof=60 to 90% =23° Cartier to 31° Cartier. This is the most economical and cheapest apparatus for the distillation of mashes from which the alcohol is to be subsequently rectified by a separate operation.

Lummus Periodic (Batch) Rectifying Stills—Especially suitable for rectifying spirits of variable composition, by non-continuous operation, and hence for small distilleries and those subject to seasonal operation.



CONTINUOUS "BEER" STILL—C310

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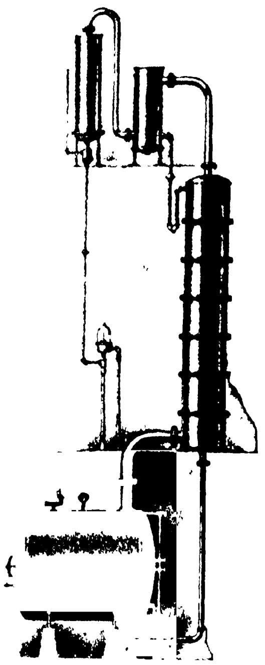


STANDARD RECTIFYING STILL—C231

For high proof industrial Alcohol —190° to 194° 95% to 97%, producing large yields of high grade spirit from proof (50%) in one operation.

Lummus Combination Continuous Distilling and Rectifying Stills—Separate and rectify alcohol for industrial purposes in one operation direct from mashes or fermented wash, and have successfully handled liquors containing as low as ½ of 1% alcohol. This apparatus can be provided to manufacture highest quality commercial spirits with simultaneous separation of fusel oils and ethers.

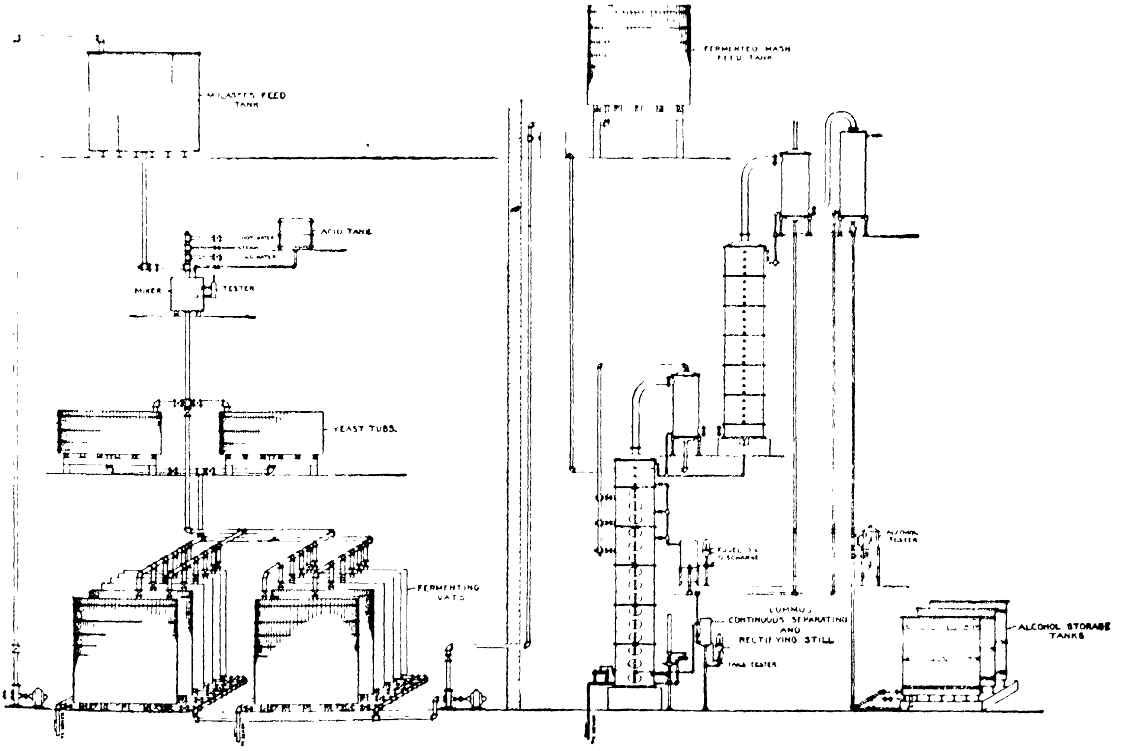
The double column continuous still shown in line illustration E239 is especially designed for the most economical manufacture of fuel alcohol.

Lummus Special Continuous Stills—For Sulphite and other waste liquors are designed to produce merchantable spirit from lowest grade materials, and are built with special reference to the suppression of offensive odors, and resistance to corrosion. They are provided with means for maximum utilization of waste heat, and the elimination of unessential elements common to conventional types of plants, so that great economy is obtained

Ether Installation—The increasing demand for alcohol for use in internal combustion engines has stimulated interest in ether as the most practical accessory ingredient for increasing vapor pressure and consequent ease of ignition. Ether has the great advantage of being produced directly from alcohol by a simple and easily controlled process. We offer improved ether generating apparatus which is designed for continuous operations and most economical use of sulphuric acid; also continuous concentrating stills for fuel as well as U. S. P. grades. Our new method of ether condensation is especially adapted to hot climates and insures complete liquefaction without the aid of expensive refrigeration.

Beverage Dealcoholization—The manufacture of beer, subject to the limitation of a maximum alcohol content of ½ of 1%, which shall at the same time be palatable and nutritious, requires that the alcohol shall be removed with a minimum exposure of the beer to heat or prolonged distillation, and its protection from contact with materials likely to affect its taste or appearance. Lummus Continuous Stills can be supplied for either vacuum or atmospheric pressure with provision for concentrating the alcohol to 190 proof. They provide for the briefest possible heating of beer, and prompt cooling and removal to storage.

We offer the services of our dealcoholization expert, whose practical knowledge of the composition and characteristics of beer and long experience in its manufacture have led to the development of a process for



MOLASSES INDUSTRIAL ALCOHOL DISTILLERY—E239

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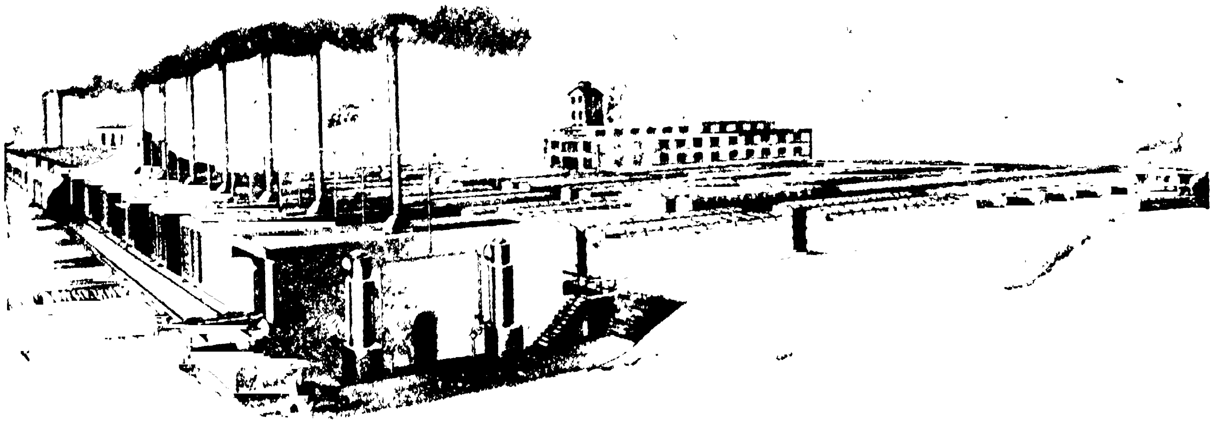


AMERICAN CHARCOAL BY-PRODUCT WORKS—D56

dealcoholization which assures a product that cannot be distinguished from the best beers of former days. The fine equipment required for this delicate process is of Lummus design and construction.

WOOD DISTILLATION

We supply complete equipment including retorts, stills, tanks and all accessories for the manufacture of charcoal and its by-preducts from either hard or resinous woods. We have standard types of retort and chemical house equipment adapted to any variety of wood susceptible of profitable distillation and offer our long experience in this industry for the solution of problems incidental to new installations and the improvement of economy in existing plant

Retort Equipment—Two standard types of retort are available according to local conditions These are (a) The oven type, standard capacity 10 cords, or 20 tons each, to which the wood is introduced, distilled, and withdrawn while resting in steel cars, without handling. (b) The cylinder type, capacity 5/8 cord or about 1 metric ton, which is loaded, fired, and unloaded by hand. Except for the difference in size and the method of handling the operation of both types is similar, and the yield and quality of products practically identical, but they differ greatly in economy of operation and upkeep according to the conditions in the locality of installation. The chief advantage of the oven type is economy of labor, and expedition in handling large quantities of material. The advantage of the cylinder type lies in the lower cost for upkeep, simplicity of repair, and the saving obtainable in countries where labor is cheaper than machinery. The cylinder retorts are also easier to install in localities remote from transportation routes

Lummus Retort Condensers—Our tubular retort condensers, accessible type, effect superior liquefaction and cooling of the valuable vapor by-products, and have the special advantage of easy access for cleaning both inside and outside of tubes A special gas trap provides for the separate recovery of waste gas of important fuel value.

For installations subject to high costs of fuel, we provide stills and equipment embodying important refinements of heat economy by means of multiple effect evaporators, heat exchangers, and the like when the savings effected justify the capital investment. On the other hand, where fuel and wood are cheap, we provide simpler and less expensive equipment equally effective from the standpoint of production.

We offer complete standardized equipment correctly proportioned and built to stand up under continuous operation including:

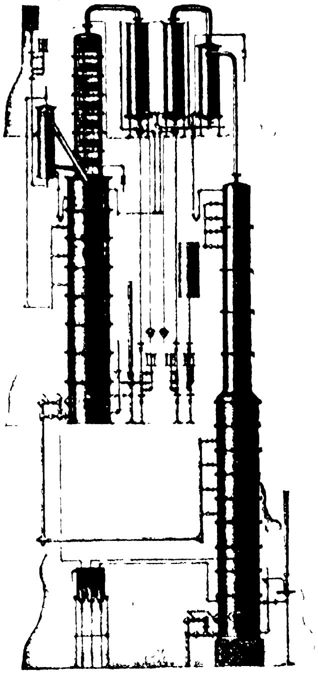
Settling Tanks and Pumps
Tar Stills and Condensers
Raw Liquor Stills or Evaporators
Neutralizing Tubs and Lime Slaker
Continuous or Batch Acetate—Alcohol Stills
Continuous or Batch Refining Stills
Seeding Pans, Wash Tanks and Pumps

Resinous Woods—Special equipment for the extraction process and for steam or destructive distillation processes—

Retorts and Condensers
Separating Tanks
Crude Stills, Tar Stills
Turpentine and Pine Oil
  Refining Stills
Storage and Shipping
  Tanks and Pumps

Methanol Refining—This process, formerly a complicated and secret operation, has been reduced to a simple and methodical procedure that may be conducted on a moderate scale in batch apparatus of reasonable cost and on the larger scale in continuous apparatus representing the maximum economy.

Lummus Continuous Refining Stills produce the highest grade of Methanol containing below 1/20 of 1% acetone.



CONTINUOUS REFINING STILL —E218

ACETONE AND KETONE OILS

Revolving or fixed retorts with special acetone retort condensers. Our special Acetone Refining Stills with Acetone Rectifying Columns produce commercial and war office grades, also light and heavy Ketone oils

ACETIC ACID

Vacuum Decomposing Stills—Standard sizes of special cast iron vacuum generators provided with revolving rouser, dust chamber and condenser. Reagent tank connection.

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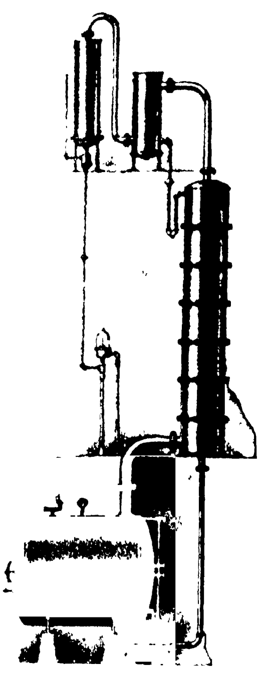


STANDARD RECTIFYING STILL—C231

For high proof industrial Alcohol —190° to 194° 95% to 97%, producing large yields of high grade spirit from proof (50%) in one operation.

Lummus Combination Continuous Distilling and Rectifying Stills—Separate and rectify alcohol for industrial purposes in one operation direct from mashes or fermented wash, and have successfully handled liquors containing as low as ½ of 1% alcohol. This apparatus can be provided to manufacture highest quality commercial spirits with simultaneous separation of fusel oils and ethers.

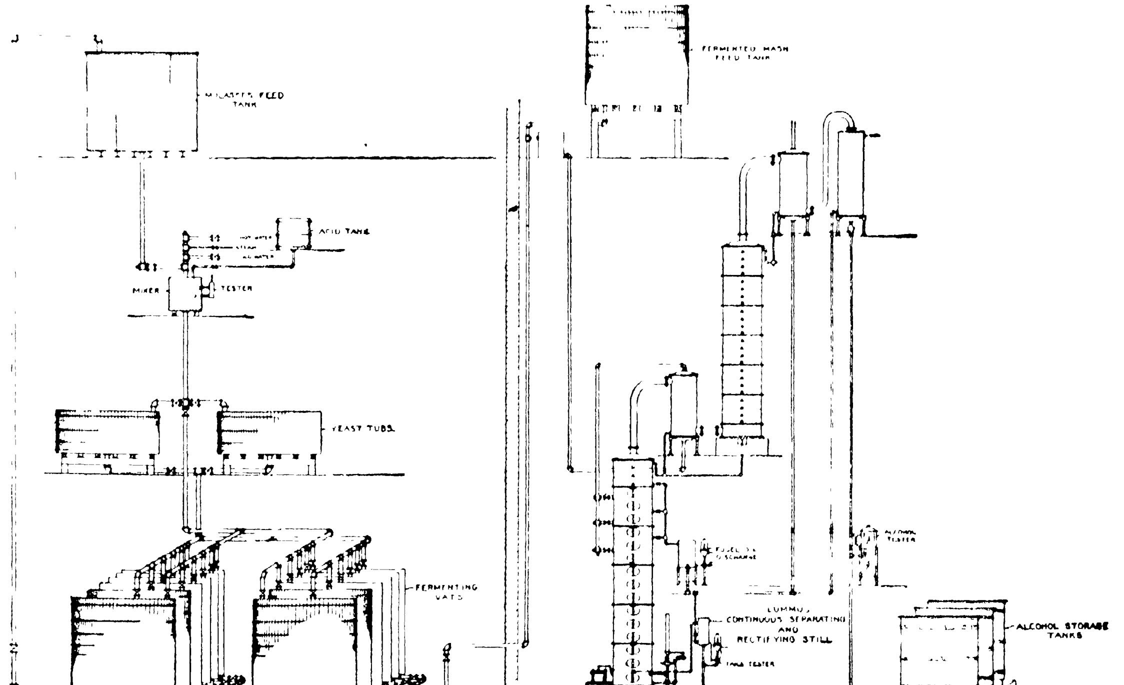
The double column continuous still shown in line illustration E239 is especially designed for the most economical manufacture of fuel alcohol.

Lummus Special Continuous Stills—For Sulphite and other waste liquors are designed to produce merchantable spirit from lowest grade materials, and are built with special reference to the suppression of offensive odors, and resistance to corrosion. They are provided with means for maximum utilization of waste heat, and the elimination of unessential elements common to conventional types of plants, so that great economy is obtained.

Ether Installation—The increasing demand for alcohol for use in internal combustion engines has stimulated interest in ether as the most practical accessory ingredient for increasing vapor pressure and consequent ease of ignition. Ether has the great advantage of being produced directly from alcohol by a simple and easily controlled process. We offer improved ether generating apparatus which is designed for continuous operations and most economical use of sulphuric acid; also continuous concentrating stills for fuel as well as U. S. P. grades. Our new method of ether condensation is especially adapted to hot climates and insures complete liquefaction without the aid of expensive refrigeration.

Beverage Dealcoholization—The manufacture of beer, subject to the limitation of a maximum alcohol content of ½ of 1%, which shall at the same time be palatable and nutritious, requires that the alcohol shall be removed with a minimum exposure of the beer to heat or prolonged distillation, and its protection from contact with materials likely to affect its taste or appearance. Lummus Continuous Stills can be supplied for either vacuum or atmospheric pressure with provision for concentrating the alcohol to 190 proof. They provide for the briefest possible heating of beer, and prompt cooling and removal to storage.

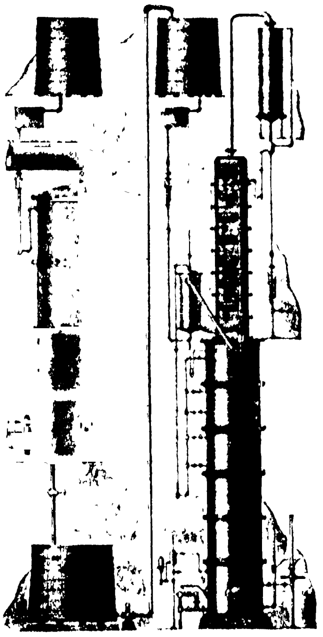
We offer the services of our dealcoholization expert, whose practical knowledge of the composition and characteristics of beer and long experience in its manufacture have led to the development of a process for



MOLASSES INDUSTRIAL ALCOHOL DISTILLERY—E239

Continued on Next Page

by ordinary means in proportion to their diffusion in uncondensable gases. Since the cost of recovery plant is proportional to the volumes of gas or vapor to be handled rather than the value or quantity of solvents to be recovered, it is wise to reduce the quantity of air when practicable. The Lummus system of reliquefying evaporated solvents from gas-vapor mixtures is embodied in relatively simple apparatus requiring little or no power, seldom any refrigeration, and only so much heat as may be required for the separation of the recovered mixtures. Inquiries should state composition of the mixture and describe kind and quantity of solvent to be recovered and the maximum quantity of air or gas to be handled.



CONTINUOUS ABSORPTION SYSTEM—D592

(b) Recovery of Volatile Solvents from Liquors and Solids—Volatile solvents that have been used in compounding and in the application of dyes, mordants and reagents, washes and cleansing mixtures, degreasing and degumming operations, however contaminated, are usually susceptible of complete recovery by means of our improved concentrating stills which we furnish in batch or continuous type with simple equipment of tanks and pumps if required. Gasoline, alcohol, acetone, wood alcohol, ethers, turpentine and oils can usually be cheaply recovered and restored to original purity even when associated with dissolved solids or complicated solutions.

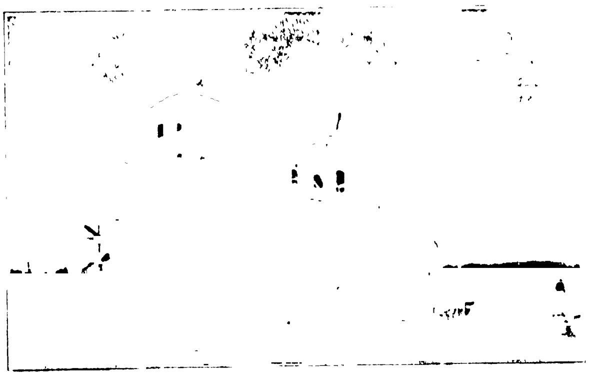
(c) Separation of Mixture of Volatile Liquids—The separation and complete purification of volatiles from complicated mixtures has become an indispensable economy in many industries. We can provide continuous fractionating stills capable of effecting practically complete separation of acetone from alcohols, benzine from oils, and other mixtures formerly considered difficult or impossible to repurify. For small quantities we offer batch stills, equally effective for separating and less expensive to install.

Gas By-Products, Benzol, Toluol—Benzol, Toluol and Xylols are of permanent importance to the dye and chemical industries; first, because of their reactive values, and second, on account of their valuable solvent properties. The unavoidable surplus has a legitimate outlet as fuel, the general recognition of which will extend as the gasoline supply diminishes.

We furnish Absorbers of the efficient cap and seal type for cases where incidental back pressure is unobjectionable. Attention is called to our new type of Low Pressure Absorber which provides maximum capillarity for complete distribution of absorbing oil, using a new contact material which provides 50 sq. ft. of surface per cubic foot of tower space occu without obstructing the free flow of gas.

Lummus Horizontal Stripping Evaporators adapted both to wash oil and tar, for removal of l oil. These stripping evaporators are readily ac sible for cleaning and repairs and are more ec than column strippers with external superheaters provide efficient heat interchangers for oils and pors which insure most economical operation.

Lummus Continuous Light Oil Separating and fining Stills are recommended in place of batch st as usually employed. The use of Continuous Still this connection represents our advance of the art. N only is steam consumption greatly reduced, but continuity of production thus afforded is an impro ment that cannot longer be disregarded. For sm installations and special conditions we offer Perio Stills of improved design and efficiency. We provi all necessary washing equipment for chemical tre ment when required.



LUMMUS REFINERY CONSTRUCTION—P119

DISTILLING AND RECTIFYING APPARATUS, CONTINUOUS AND PERIODIC

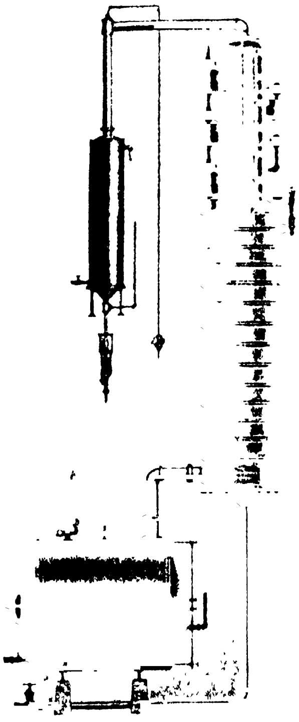
To simplify description we roughly divide all standard types of stills into three classes: Plain Stills, Column Stills, and Continuous Stills.

Standard Plain Stills—Used for rough concentration of volatile liquids from solutions containing dissolved solids or less volatile materials. The essential elements of all Standard Plain Stills are a boiler or closed heating vessel in which vapor is generated, and a condenser for reliquefying the vapors. Contrary to common tradition, the shape of the still but slightly affects the quality of product, but is determined by mechanical considerations. Standard Plain Stills are of vertical or horizontal cylinder and pot-still types, heated by steam coils, tube bundles, steam jackets, or direct fire, and can be provided with stirring blades, cleanout doors, and special openings and attachments according to requirements. Capacities from 20 gallons to 20,000 gallons.

Standard Column Stills—Are designed for high concentration of volatile liquids, and, while more expensive than plain stills, are much more economical since they perform in one operation work that would require repeated distillations in the Plain Stills. They are comprised of a boiler, a distilling or rectifying column, an intermediate or regulating condenser, and a final or cooling condenser. Standard types include horizontal and upright boilers, distilling columns built on unit system to permit of varying the number of chambers in accordance with requirements, tubular or coil

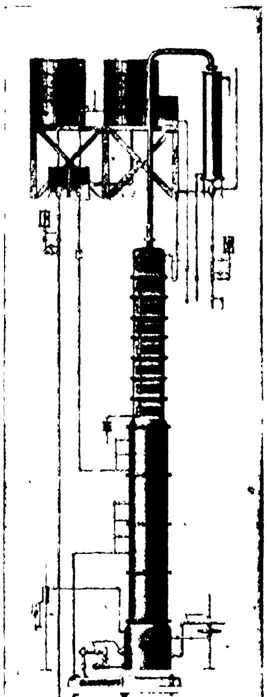
Continued on Next Page

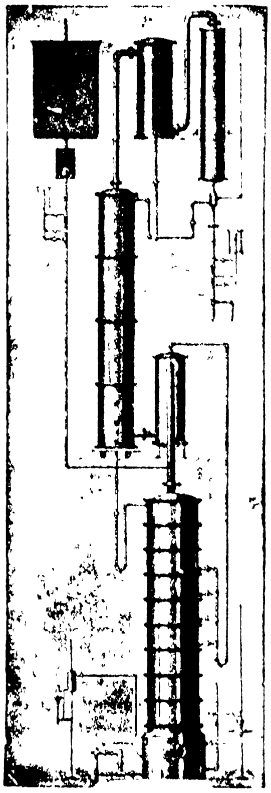
ing condensers, and cooling condensers, together with vapor pipe, fittings and accessories. It ortant that the still should always have capacity dle the entire batch of material and a surplus to provide for redistilling intermediate and end fractions. While the size of the still fixes the quantity of a batch, the size of the column and condensers determines the rate of operation and quality of products and should, therefore, be selected with careful reference to the time for completing the distillation. Standard Column Stills can be provided of similar materials and capacities to the Plain Stills.


SPECIAL REFINING STILL—D471

When inquiring for stills for any specific purpose, it is important to describe as precisely as possible the material to be distilled, products desired, and the maximum quantities to be handled in the working hours to which the operation is limited, or the rate per hour if for continuous operation. Information should also include quantity and pressure of steam available, temperature and quality of water, and any limit to be observed in respect to cost of installation, cost of fuel and materials, and any regulations pertaining to the trade or locality. With this information we can often assist materially in the selection of most profitable equipment for the purpose to be served.

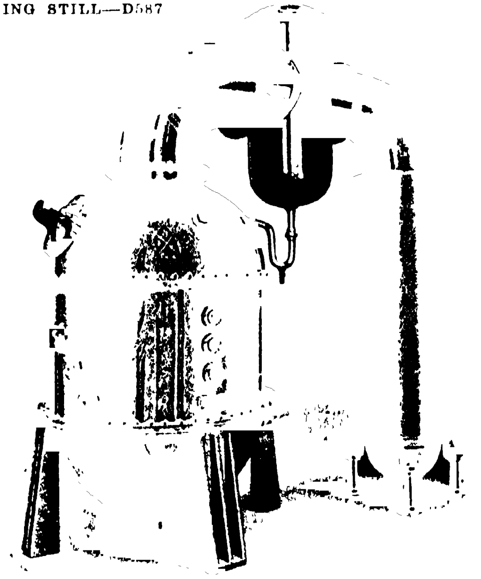
Standard Continuous Stills—Are available for almost any kind of distillation that can be accomplished with Plain or Column Stills, and closely approach the maximum of theoretical economy in operation. Being built for automatic control, and extreme economy of steam and other operating costs, they are necessarily more expensive in small sizes but actually much cheaper where large quantities of material are handled. Continuous Stills consist of one or more distilling columns heated by steam and provided with condensers, coolers, feed heaters, and accessory devices for automatic regulation of heat, feed supply, and the discharge of distillates and residues. Standard sizes have capacity from 25 gallons to 3,000 gallons per hour of feed liquor, and can be furnished in copper, steel, cast iron and alloys with protective linings according to specific requirements.


CONTINUOUS FRACTIONATING STILL—D586
Patented System of External Dephlegmation


CONTINUOUS CONCENTRATING STILL—D587

VACUUM STILLS AND EVAPORATORS

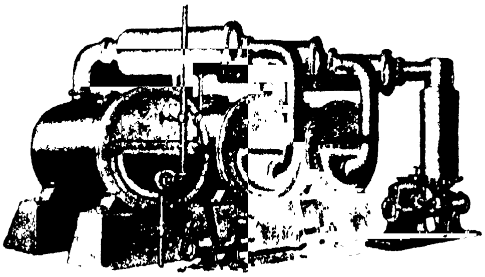
Jacket and Calandria Heated Vacuum Stills—With or without revolving rouser, vacuum condenser and receiving chamber, substantially built of copper with polished cast bronze fittings, copper vacuum condenser, and equipped with wet or dry vacuum pump according to size and purpose served.


VACUUM PAN—G30

Vacuum Condensers and Pumps—Standard types of surface condensers and jet condensers, while well adapted to vacuum work when the vapor to be condensed is water, are entirely unsuitable to the condensation and recovery of alcohol, acetone and other volatile liquids of high value. Lummus Special Vacuum Surface Condensers are equipped to operate either with barometric, full pipe or with closed receiver tanks. Steam or power driven vacuum pumps can be supplied to requirements.

Continued on Next Page

Multiple Effect Evaporators—For the economical concentration of dilute solutions we offer multiple effect apparatus of both horizontal and vertical tubular type Our Submerged Tube Double and Triple Effect and Reversible Evaporators are particularly well adapted to liquids having a tendency to clog heating surfaces Materials steel, cast iron and copper, with protective coatings if required Jet or surface condensers, pumps and receiver tanks

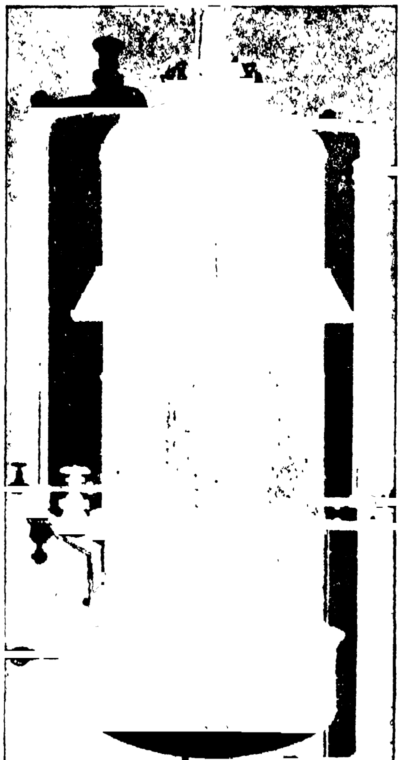


HORIZONTAL TRIPLE EFFECT EVAPORATOR—G22

EXTRACTORS AND DISSOLVERS

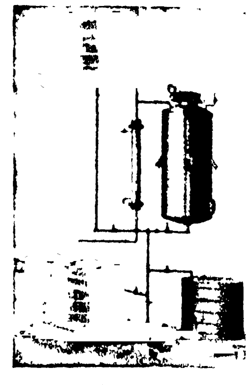
The processes known as extraction, percolation, leaching, and diffusion are simply dissolving operations varying only in the method of exposing soluble substances to the solvent with a view to most rapid or complete solution. For example, lumpy and non porous materials must be reduced to a suitable state of division in order to expose surface to the effective action of solvents. Similar considerations require very different treatment of fibrous, cellular and powdered materials and for pulps and pomaces

We can generally furnish stationary, dumping or revolving extractors adapted to batch or semi-continuous operation.



AUTOMATIC EXTRACTOR SOXHLET TYPE—P137

Lummus Batch Extractors—Are designed for upward or downward displacement operations according as the materials have a tendency to float or sink in the menstruum employed; stationary and dumping types of steel, copper and cast iron, with protective linings, if required.

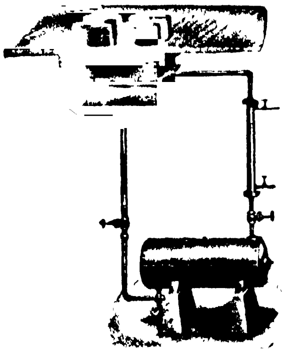


BATCH EXTRACTOR—B21

Lummus Series Extraction Batteries—Provide for stage concentration by means of which solutions of practically uniform strength are obtained requiring a minimum of cost to evaporate.

Dissolvers—Lummus Automatic Dissolvers are used in making stock solutions of caustic soda, calcium chloride, bichromate, alum, blue vitriol and other crystallized or fused chemicals, and are extensively used in Chemical Works, Textile Mills, Soap Factories, Bleaching and Mercerizing Plants and Rubber Reclaiming Works. They operate with cold water and require no steam either for heating or stirring, and have no moving parts to get out of order, or to consume power They eliminate all danger to employees and require no attention other than the initial charging of the apparatus. They save time, labor and money, and save their cost in a few months.

One, two, four and ten drum sizes.



CAUSTIC DISSOLVER—D557

GAS-VAPOR ABSORBERS AND SCRUBBERS

Standard types of towers include bubbling towers, hurdle towers, and spray type construction designed for intimate contact of liquids and gases at atmospheric, reduced or high pressure subject to regulated control of temperatures and flow, and can be equipped with precoolers, after-coolers or internal hearing or cooling coils. Also see under Gas By-Products.

CONDENSERS AND HEAT INTERCHANGERS

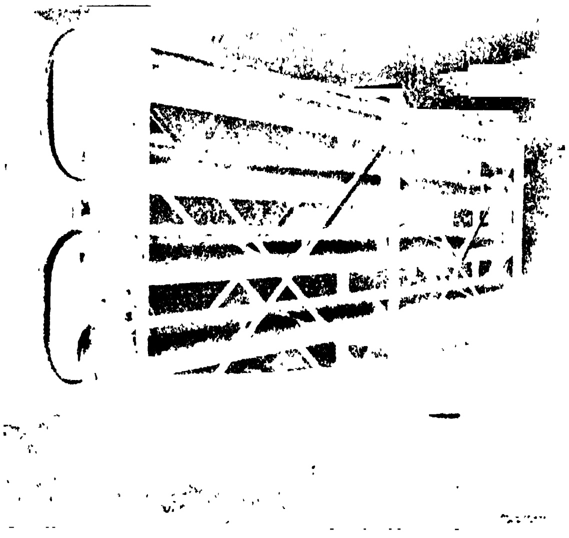
Our Standard Condensers and Coolers cover practically the entire range of industrial requirements including Lummus Tubular Retort Condensers for Charcoal Ovens and Retorts, Acetone Retorts and other high temperature operations. Lummus Standard Condensers and Coolers of all capacities and of any suitable material provide for temperature regulation, and for the complete liquefaction of volatile or corrosive products. We build Accessible Condensers and Coolers especially advantageous in localities where artesian and river waters contain encrusting material re

Continued on Next Page

frequent removal. We special coils and parallel condensers for precool- and recuperative con- for the utilization of heat.

ACCESSIBLE CONDENSER—GC108

Lummus Heat Interchangers available for the econom- transfer of heat between, between vapors and, and between vapors and With full information of and temperatures we generally supply a standard of high efficiency at moder- cost, and of suitably durable material.



HEAT INTERCHANGER, REMOVABLE TUBE BUNDLES—P136

AIR LIFTS, METROLIFT

The Metrolift is an automatic air lift or montejus that will lift and convey any clear liquids, at the same time measuring, counting and recording the service. It will start and stop itself without attendance, and in short perform the service ordinarily required of a steam pump plus a watchful (?) attendant. It is not contended that pumping with compressed air will compete with a steam pump in cost of operation. The exigencies of chemical and related manufactures, however, constantly require the handling of irregular volumes of liquid, involving a responsible and intelligent attendance that is becoming difficult and expensive to obtain.

The Metrolift will start when there is work to do and stop when the work is done; will turn on and shut off the power and record how much it has done.

METROLIFT—D622

EXPERIMENTAL AND DEMONSTRATION APPARATUS

The increasing demand for apparatus to demonstrate processes and to be employed in checking manufacturing operations on a moderate scale has led to the development of a line of experimental plant intermediate between laboratory and manufacturing scales of operation. This line comprises standard units including Stills, Rectifiers, Condensers, Extraction Vessels, Tanks, and Accessories such as hand pumps and gauges, which permit setting up complete plant for the conduct of manufacturing operations on a small scale obtaining results that can be duplicated in full size plant. The unit system of construction enables us to supply this apparatus at moderate cost, and it is extensively used in universities, technical schools and private industrial laboratories. Standard Distilling, Rectifying and Extracting Outfits are available embodying all essential controls with piping and supports for installation. All standard units are designed for operation by steam at 15 to 100 pounds pressure above atmosphere.

Capacities of standard still units, 20 to 100 gallons. Tanks, 50 to 200 gallons. Other units in proportion.

TANKS

Standard storage tanks can be provided in steel, copper, wood, and glass or enamel lined, for any kind or quantity of volatile liquids, corrosive and neutral. Standard tank equipment includes manhole, self-closing gauge glass, filling and discharge connection, vent and vacuum relief valves. Special tanks for vacuum and high pressure work and for mixing, measuring and storage of volatile and fixed liquids and stock solutions. Constant head supply tanks and invariable flow gauges supplied for any required capacity.

CENTRALIZED REFINERY CONTROL—P138

ESTIMATES AND QUOTATIONS

Inquiries for prices and information should give complete information in respect to kind and quality of materials to be handled or products to be manufactured per day or hour and the number of hours per working day as well as any essential information concerning heat, power, water and transportation conditions.

The labor and time required to prepare estimates have been greatly increased by the general unsettlement of prices and we therefore request correspondents to state clearly whether rough estimates are desired or if definite quotations are justified by their intention to purchase—should prices prove satisfactory.

Correspondence in French and Spanish.

Telegraphic Code: A. B. C. 5th edition.
Cable Address Lummus Boston.

McDANEL REFRACTORY PORCELAIN COMPANY

Manufacturers of

Refractory Porcelain Ware

BEAVER FALLS, PENNSYLVANIA

PRODUCTS

Vitrified porcelain ware of any shape and size, glazed or unglazed for use at any temperature your needs require up to 1600 C. Pyrometer tubes, protection tubes, insulating tubes and combustion tubes.

FACILITIES

Our plant is fully equipped with the most modern equipment to meet any requirements of the users of vitrified porcelain apparatus.

PYROMETER TUBES

Our tubes are produced from a very careful and scientific mixture of raw materials which gives us a product that will withstand all temperatures up to 1600°C., a very hard impermeable inert glaze covering, preventing deterioration under oxidizing or reducing conditions.

SHIELD TUBES

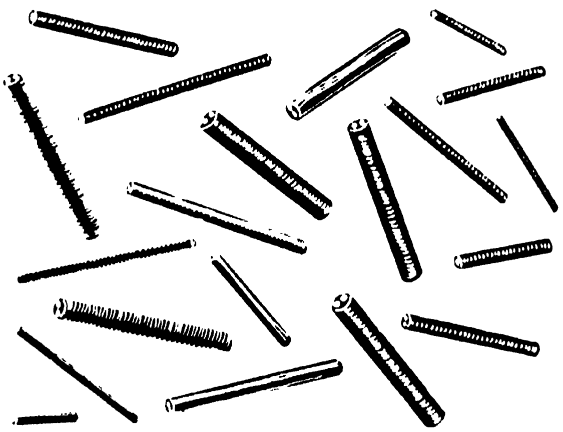
Made from standard materials to withstand most severe abrasive conditions and high temperatures. We aim to meet the demands of various Industries which in recent years have developed processes requiring higher temperatures than heretofore.

INSULATING TUBING

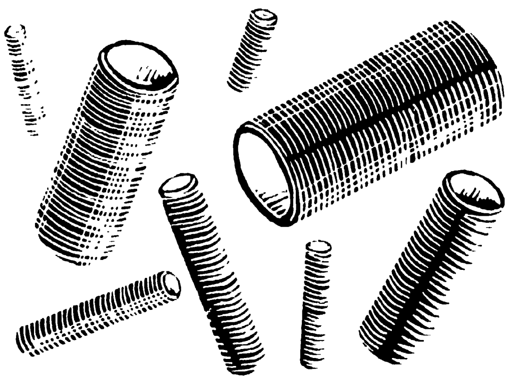
Any size and shape required, made from the same high temperature refractory bodies as the pyrometer tubes.

COMBUSTION TUBES

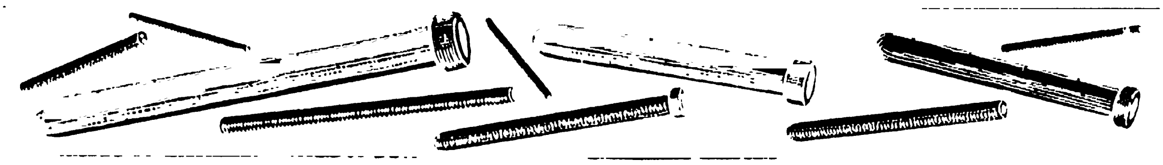
Very high mechanical strength, gas-tight and withstand remarkable temperature changes. Very resistant to corrosive substances, such as oxides of lead, six months' continuous use in steel combustions in presence of lighterage has been brought to our attention.



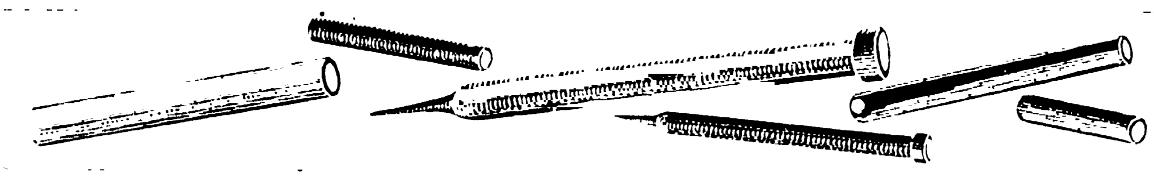
INSULATING TUBES



HEATING ELEMENT CORES



PYROMETER TUBES, GLAZED



COMBUSTION TUBES

A. C. McGOWAN AND COMPANY

Dealers in

Used or Reclaimed Burlap and Cotton Bags

206-208 W. Kinzie St.,
CHICAGO, ILL.

PRODUCTS

Used or reclaimed burlap and cotton bags.

FACILITIES

This company has sources of obtaining a large supply of burlap and cotton bags which have been used but once and are in comparatively good condition. They are given careful individual inspection, are then graded and thoroughly machine-cleaned, put in first class condition, and assorted in sizes. All bags are guaranteed 100% usable.

SERVICE

We shall be pleased to send samples of typical bags to those interested, and will furnish such information regarding sizes, ability to maintain a constant supply, etc., as may be desired.

Many important and nationally known manufacturers are using McGowan reclaimed bags, and express complete satisfaction with the service rendered to them by us over a period of years.

The use of the right kind of bag is a very important item of production. We are in position to render expert advice on this method of packing and transportation of a great variety of products.

INFORMATION REQUIRED FOR MAKING ESTIMATES

We shall be glad to receive your inquiries. Those who write us should furnish as complete information as possible regarding the product to be bagged. The possession of this complete information has frequently enabled us to suggest a more economical package at a great saving in cost.

USES

Many industries have made use of reclaimed bags at a great saving in cost of production. They have found that the bags furnished by us fulfill their purposes in every respect as well as would new bags.

Manufacturers who have not considered the use of reclaimed bags will find on investigation an interesting possibility in reducing the cost of production.

We specialize in bags for the various branches of the chemical and allied industries. The following are a few of the chemical products being successfully packed and shipped in reclaimed bags:

Agar-agar
Aloes

Barks

Cardamoms
Carnauba Wax
Cement
Chalk

Drug Leaves
Drug Roots
Drug Seeds
Drug Twigs
Dye-wood Chips

Fertilizers
Flour

Glauber's Salt
Gums

Limestone

Metals
Minerals

Nut Shells

Rubber Scrap

Salt
Sugar
Sulfur

MAGNESIA ASSOCIATION OF AMERICA

721 BULLETIN BUILDING, PHILADELPHIA, PA.

EXECUTIVE COMMITTEE Wm. A. Macan, *Chairman*

George D. Crabbs, The Philip Carey Co., Cincinnati, Ohio
Alvin M. Ehret, Ehret Magnesia Mfg. Co., Valley Forge, Pa.
J. R. Swift, The Franklin Mfg. Co., Franklin, Pa.
R. V. Mattison, Jr., Keasbey & Mattison Co., Ambler, Pa.

Manufacturers of "85% Magnesia" Insulation for Power and Heating Systems

PRODUCT

"85% Magnesia"—An inorganic, inert mineral composition, composed of eighty-five per cent. of commercially pure carbonate of magnesia, with which is incorporated sufficient mineral fiber to act as a binder, thus giving the necessary structural strength.

APPLICATION

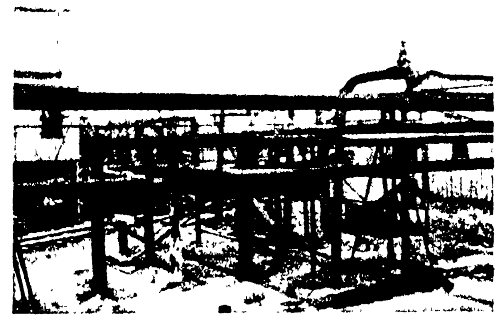
Not only can "85% Magnesia" be used throughout the chemical industries for all pipe lines, whether indoor or outdoor, but it can also be used for the insulation of valves, flanges and fittings. Many engineers do not cover these for fear they will not be able to get at them readily for repairs, etc. It must not be forgotten, however, that the heat-loss from a pair of heavy ten-inch flanges under high pressure is equal to over a ton of coal per year. Valve bodies, drips, steam-traps, the cylinders of duplex-pumps, in fact, every heated metal surface also waste large quantities of heat and should all be properly protected. Moreover, "85% Magnesia" can be used for the insulation of stills, evaporators, digesters, cookers, drying ovens, retorts, and all forms of heated chemical manufacturing equipment regardless of size or irregularity of surface.

"85% MAGNESIA" BLOCK AND SEGMENT COVERING AT SEABOARD BY PRODUCT COKE CO., JERSEY CITY, N. J.

"85% Magnesia" is manufactured in the form of half sections, for pipes up to 10" diameter, segments for larger-sized pipes and curved surfaces, blocks for boilers and flat surfaces, and plastic (or fibrous powder) for irregular surfaces, filling of joints, etc.

GENERAL SERVICE EXPERIENCE

The insulation value of "85% Magnesia" coverings is attested by the records of the largest industrial chemical concerns, such as E. I. du Pont de Nemours & Co., Seaboard By-Product Coke Co., Calco Chemical Co., Canadian Electro Products Co., etc., as well as by the records of over 30 years' experience in the U. S. Navy, the leading steamship lines, railroads, locomotive builders, power and heating plants and the largest hotels, public buildings, skyscrapers and other large structures in America and elsewhere.

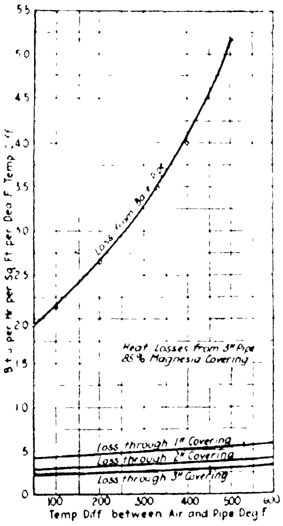


"85% MAGNESIA" ON OUTSIDE PIPE LINES, E. I du PONT de NEMOURS & CO., CARNEY'S POINT, DEL.

EFFICIENCY

The heat saving efficiency of "85% Magnesia" is remarkable, being equal to from 80% to 90% of the heat that would be wasted by bare pipes.

By its use, the operation of outdoor pipe lines of indefinite length becomes possible, thus enabling an economical supply of steam from a central boiler plant and the piping of hot liquids from one portion of a large plant to another without loss of heat units.



HEAT LOSSES THROUGH "85% MAGNESIA" COVERINGS ON 3-IN. PIPE

DURABILITY

Recent evidence of the great durability of "85% Magnesia" leads to the conclusion that there is no practical limit to its useful life, save that of the plant itself. It frequently happens that after removal from old steam pipes, the "85% Magnesia" coverings are replaced on new work. Even the small pieces of "85% Magnesia" that are broken up in connection with repairs can be ground and used again in plastic form with good results.

MAGNESIA ASSOCIATION SPECIFICATIONS

Complete specifications can be had upon application to the Association.

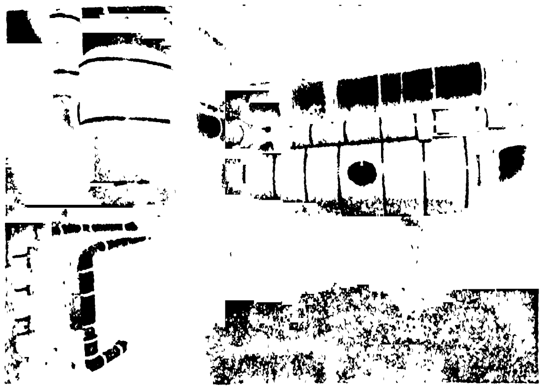
Continued on Next Page

HEAT RESISTANCE

like organic materials, "85% Magnesia" shows tendency to deteriorate under prolonged contact high temperatures such as those of superheated . The tendency is in the other direction. Sev- notable tests under continued temperature of from to 900 F. have shown increased efficiency as great per cent.

HANDBOOK

A practical handbook, "Defend your Steam," deal- fully with the manufacture, uses and application of Magnesia coverings and with the theory and practice of heat insulation, will be sent free on request.



"85% MAGNESIA" COVERINGS IN GREISS & PFLEIGER TANNERY, WAUKEGAN, ILL.

EXPLANATION OF TABLES AND CURVES

The thicknesses given in these tables and curves are the proper thicknesses for the maximum net saving for each condition. They are based on a period of service of 8,760 hours per year. Where pipes are cold part of the year, multiply the cost of coal by the number of hours per year the pipes are hot and divide by 8,760, use the value obtained instead of the actual coal cost. Twenty per cent. of the list cost has been allowed as the cost of application, and 13% of the total cost for the annual fixed charges (6% interest, 5% depreciation, 2% miscellaneous). The values of the heat-losses used in calculating the net savings are based on a series of experiments, covering a period of two years, made for the Magnesia Association of America by the Mellon Institute of Industrial Research of the University of Pittsburgh.

Table No. 2 is for use in plants where costs are not accurately known. They are based on average conditions. In transforming the steam-cost to coal-cost, it has been assumed that 75% of the cost of steam is coal cost, that one pound of coal will evaporate seven pounds of water, and that each pound of steam contains 1,000 B. T. U. above the feed-water temperature.

How to Use the Tables—Determine the following factors in connection with the heated surfaces to be covered: Cost of coal, steam-pressure and size of pipes.

Select the table most nearly corresponding to the cost of coal, and the column in the table nearest to the condition of steam-pressure or temperature. The thicknesses in this column are the proper thicknesses for the pipe sizes given at the left.

Example—Cost of coal $3.75, steam pressure 150 lbs., size of pipe 12 in. Select the $4.00 per ton table, and the column headed, "Steam 100-200 lbs." Run down this column to the 12-in. line and find that Double Standard (D.S.) is the proper thickness for maximum net saving.

TABLE NO. 2—THICKNESS OF "85% MAGNESIA" FOR MAXIMUM NET SAVING

S—Standard Thickness. DS—Double Standard Thickness (see Table No. 1)

COST AT $2.00 PER TON

Size pipe, in.	Hot water 175° F	Steam 5 lbs.	Steam 100-200 lbs.	200 lbs. 150° F super heat	200 lbs. 300° F super heat
¾	S	S	S	1½"	DS
1½	S	S	S	1½"	DS
3	S	S	S	1½"	DS
6	S	S	1½"	2"	DS
12	S	S	1½"	2"	DS
24	S	S	2"	3"	DS
Flat	1	1½	2"	2"	3½"

COST AT $4.00 PER TON

Size pipe, in.	Hot water 175° F	Steam 5 lbs.	Steam 100-200 lbs.	200 lbs. 150° F super heat	200 lbs. 300° F super heat
¾	S	S	1½"	DS	2"
1½	S	S	1½"	DS	2"
3	S	S	DS	DS	3"
6	S	1½"	DS	3"	3"
12	S	1½"	DS	3½"	4"
24	S	1½"	DS	3½"	4"
Flat	1½"	2"	[illegible]	4"	[illegible]

COST AT $6.00 PER TON

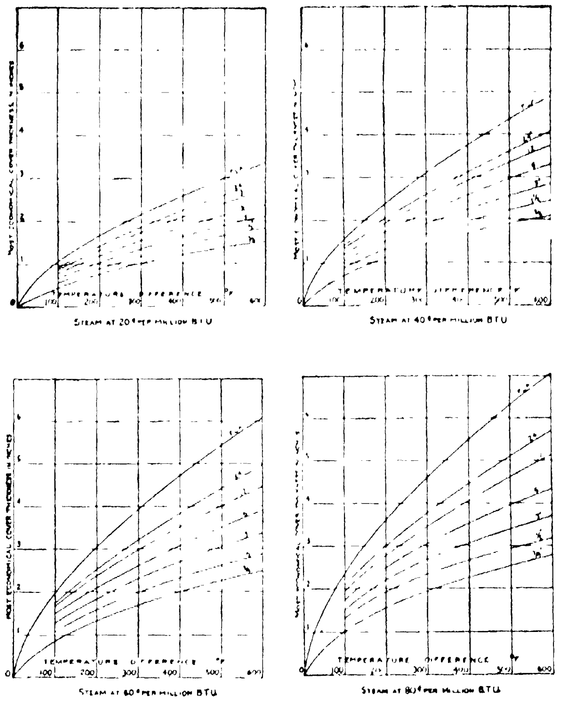
Size pipe, in.	Hot water 175° F	Steam 5 lbs.	Steam 100-200 lbs.	200 lbs. 150° F super heat	200 lbs. 300° F super heat
¾	S	S	DS	2"	2"
1½	S	1½"	DS	2"	3"
3	S	1½"	DS	3"	3"
6	1½"	2"	DS	3"	4"
12	1½"	2"	DS	4"	4"
24	1½"	2"	DS	4"	5"
Flat	2"	3"	4"	5"	6"

COST AT $8.00 PER TON

Size pipe, in.	Hot water 175° F	Steam 5 lbs.	Steam 100-200 lbs.	200 lbs. 150° F super heat	200 lbs. 300° F super heat
¾	S	1½"	1½"	2"	3"
1½	S	1½"	2"	3"	3"
3	1½"	2"	3"	3"	3"
6	1½"	2"	3"	4"	4"
12	2"	3"	3"	4"	5"
24	2"	3"	4"	6"	5½"
Flat	2½"	3½"	4½"	6"	7"

N. B.—These tables, with the curves accompanying, are based on the latest determination of fact, arrived at by the Mellon Institute of Industrial Research, Pittsburgh, Pa.

The curves are for use in plants where heat costs, steam temperatures, etc., are accurately known. They are applicable to all heated surfaces, since they are based on the temperature of the surface and the value of the heat in dollars per million B.t.u.



STEAM AT 20¢ PER MILLION BTU

STEAM AT 40¢ PER MILLION BTU

STEAM AT 60¢ PER MILLION BTU

STEAM AT 80¢ PER MILLION BTU

CURVES SHOWING THICKNESS OF "85% MAGNESIA" FOR MAXIMUM NET SAVING

MAGNETIC MANUFACTURING COMPANY

"High Duty" Magnetic Pulleys and Magnetic Separators And Special Magnetic Equipment

MAIN OFFICE AND WORKS
788-790 WINDLAKE AVE., MILWAUKEE, WIS.

BRANCH OFFICES
New York
Pittsburgh
Chicago
Cleveland
Atlanta
St Louis
Cincinnati
Los Angeles
Philadelphia
Buffalo

PRODUCTS

"High Duty" Magnetic Pulleys, Magnetic Separators for all Foundries, "High Intensity" Magnetic Separators, Ore Concentrators for Wet and Dry magnetic concentration, Magnets and Magnetic Separators for all problems.

"HIGH DUTY" MAGNETIC PULLEYS

"High Duty" Magnetic Pulleys when used in grinding, crushing and pulverizing plants afford absolute protection to this equipment and aid in maintaining continuous production by eliminating delays and shutdowns which are caused by stray pieces of iron which break and seriously damage crushing machinery. These Magnetic Pulleys are made in all diameters and for all belt widths.

MAGNETIC PULLEY AS DISCHARGE PULLEY FOR BELT CONVEYOR
Note Scrap Iron Retained and Kept from Entering Crusher
Send for Bulletin "No. 26"

"High Duty" Magnetic Pulleys are exceptionally powerful, in fact, are by direct comparison from 25 to 50% stronger than any other make of Magnetic Pulley of equal size. This increased strength is due to its superior design and construction as well as also to the ventilation of these pulleys, which affords 2½ times the radiating surface found on the enclosed type of Magnetic Pulley.

Magnetic Pulleys are easily installed in place of ordinary cast iron head pulley of a belt conveyor and where no belt conveyor is available, we usually furnish complete Magnetic Pulley Separators with bilge boards or self-feeding hoppers. Magnetic Pulley Separators are complete and self-contained units, and can be made for any pulley centers.

HIGH INTENSITY MAGNETIC SEPARATORS AND ORE CONCENTRATORS

The concentration of ores and minerals can be accomplished economically by our "High Intensity" Magnetic Separators. Such ores as Zinc and Lead Sulphide, Wolframite, Sheelite, Chromite, Leucite, Manganese, Illmenite, Garnet, Monozite, Nickel, Pyrite, Pyrrhotite, Chalcopyrite and Cassiterite lend themselves readily to Magnetic separation.

The lower power consumption, maintenance and labor charge together with a very high recovery of values, places the cost per ton of magnetic concentration considerably below that of other methods.

Magnetic Separation is very flexible and will fit into nearly every mill process in that these machines can be adapted to either wet or dry separation.

"HIGH INTENSITY" MAGNETIC SEPARATOR
Send for Bulletin "D"

MAGNETIC SEPARATORS

Our Type "L" Magnetic Separators are especially adapted in use in refining brass and aluminum borings and skimmings and are also used in refining abrasives and removing iron from other fine granular materials.

Type "F" Magnetic Separators are used in Gray Iron, Steel and Malleable Iron Foundries for reclaiming iron from sand and refuse. Net savings effected in iron recovered amounts to $1.10 to $1.40 per ton of melt per day.

MAGNETS AND MAGNETIC SEPARATORS FOR ALL PROBLEMS

We are equipped to design and build special magnets and Magnetic Separators for such problems which cannot be solved by one of our standard types.

We maintain a laboratory for testing ores and minerals for their Magnetic susceptibility and make such tests gratis. We give our customers real engineering service which is backed by twenty years' experience in designing and building Magnetic Separators.

MALCOLMSON ENGINEERING AND MACHINE CORPORATION

Manufacturers, Engineers, Contractors

NEW YORK CHICAGO ST. LOUIS

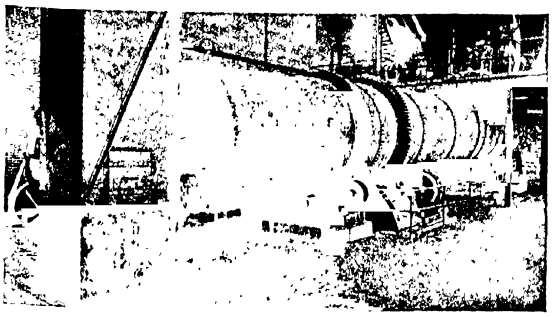
SERVICES

Engineers and contractors for complete plants for briquetting; for low-temperature distillation of bituminous and lignite coals and peat; for drying, grinding and screening of all materials; and for the production of steam and electric power.

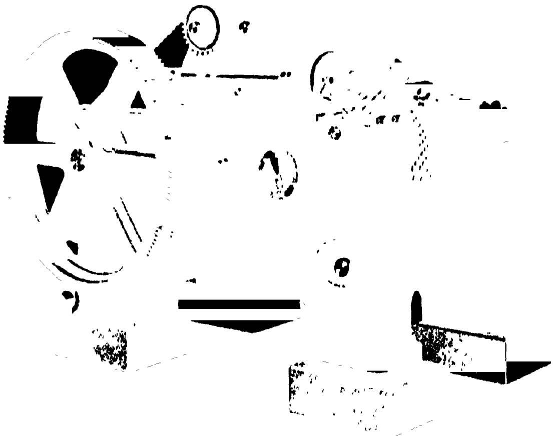
We have a complete shop equipped for the manufacture of briquetting presses, fluxers, mixers and special equipment for low-temperature distillation plants. We make complete investigations and reports.

KOMAREK BRIQUETTING PRESSES AND RUTLEDGE FLUXERS IN PLANT OF THE CLINCHFIELD CARBOCOAL CORPORATION, SO. CLINCHFIELD, VA.

Capacity 20 tons per hour for each unit

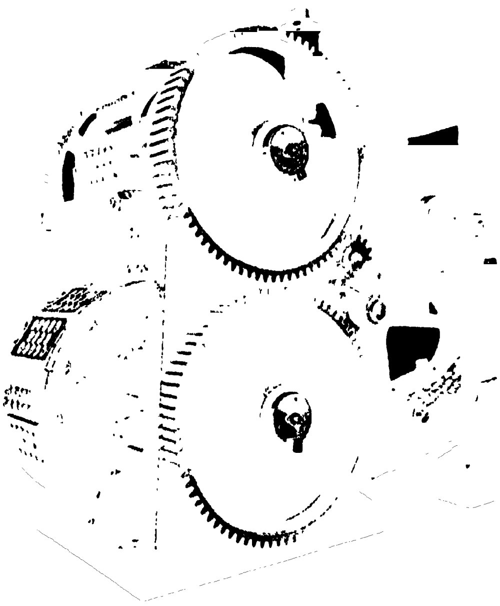


DRYING PLANT



IMPROVED ROLL PRESS

Capacities from 5 to 100 tons per hour for the manufacture of coal and other briquets



RUTLEDGE BRIQUETTING PRESS

Capacities from 25 to 150 tons per hour manufacturing cylindrical and rectilinear briquets.

MANTIUS ENGINEERING CO., INC.

Consulting Engineers
15 East 40th Street
NEW YORK, N. Y., U. S. A.

SERVICES

The design and construction of complete chemical plants and special machinery.

The development of new processes and the design of experimental plants and apparatus.

Estimates and specifications for the purchase of new equipment and supervision of its installation.

Appraisals of existing plants and their reorganization for greater efficiency.

Investigations and confidential reports on the practical and commercial value of manufacturing processes to owners, banks, or fiscal agents.

GENERAL

More than twenty years' experience has given us valuable data for the design and construction of special machinery and complete chemical plants. Present conditions require economical machinery and efficient operation, and it is our aim to design the equipment so that it will meet the particular requirements of our clients. We have made a particular study of the efficient recovery of waste products, and are always glad to cooperate with our clients who wish to convert waste into profits.

We are prepared to furnish preliminary reports, layouts and estimates of complete plants or parts thereof, and after thorough study will supply detail plans and specifications for the purchase and erection of such plants, and give instructions and data for their operation. We have made a specialty of:

EVAPORATORS

Our designs cover not only all standard types of vacuum and pressure evaporators made of cast iron, copper or steel, but particularly the construction of special types built of solid lead, lead lined, glass enameled steel, or glass, and heated with steam, hot oil, or electricity.

DRYERS

We design drying systems to suit particular conditions, and after careful study of each problem. Also special dryers for delicate material, heated by electricity with perfect temperature control.

DISTILLING APPARATUS

Special types working under atmospheric pressure or vacuum, and built of cast iron, copper, steel or glass enameled steel.

CAUSTIC SODA AND POTASH PLANTS

We have designed complete plants and special equipment for the manufacture of these products from the basic raw materials, and have made a specialty of recovering these chemicals from various waste liquors (see flow sheet).

MALT EXTRACT, MALTOSE AND YEAST

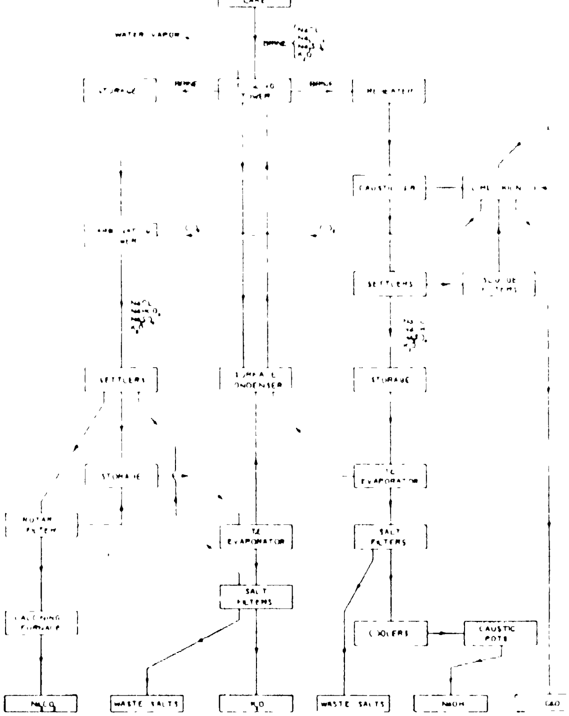
The last two years have shown a great activity in this particular field, and we have designed and installed a large number of plants for these valuable food products.

SALT FROM SEAWATER

Our knowledge and experience in this particular line have enabled us to overcome successfully the difficulties that have to be met when concentrating large quantities of seawater for the production of distilled water and pure table salt, our Multiple Effect Evaporators do not require cleaning and the salt is not contaminated by calcium sulphate.

WOOD DISTILLATION

We are in position to build complete plants, as also special equipment for the economical manufacture of acetate of lime, acetic acid and acetone.



FLOW SHEET OF POTASH PLANT

BY-PRODUCT AND RECOVERY PLANTS

We invite our clients to write us regarding their particular problems as to the utilization of by-products and recovery of waste material. We have made a thorough study of this important branch of the chemical industry, and as an instance refer to the Simonson-Mantius Sludge Acid Recovery Process described on the following page.

MISCELLANEOUS

While our work covers the whole field of the chemical and allied industries, we wish to mention a few products for which we have designed special machinery: Sodium and Potassium Chlorides, Chlorates and Sulphates, Ammonium Salts, Zinc Chloride, Sodium Sulphide, Black Liquor and Sulphite Waste, Milk and its products, Dyewoods and Extracts, and others.

Continued on Next Page

SLUDGE ACID RECOVERY

The **Simonson-Mantius Process** (patent pending) been developed after careful study of the defects existing plants, and in this process the separated of from 30° to 35° Bé. is concentrated under high vacuum to 65° Bé., using steam at 150 lbs pressure as heating medium, or to 66° Bé. by the use of hot oil. the low temperatures prevailing in the apparatus, practically no acid is destroyed, and **no fumes** can into the atmosphere, as the small amount given off during the final concentration is absorbed by the cooling water in the condenser.

The organic matter is not burned but becomes insoluble during the concentration, and if objectionable can be removed by filtration. Radiation losses are very small and fuel consumption is low on account of the acid being concentrated in a closed system at low temperature. It has been found that 65° acid with 90% acidity is entirely suitable for the chemical treatment of oils, but if necessary, the density may be raised to 66° (93% acidity) by adding a small quantity of fuming acid. Many refineries operate their boilers at 150 lbs. pressure, and therefore will not require an oil heating equipment.

OPERATING EXPENSES

A plant recovering 20 tons of acid in 24 hours requires about 25 bbls. of fuel oil, or 6.3 tons of coal, and one man can operate from one to three units at the same time if conveniently located. The power consumption does not exceed 300 K.W. hours, and repairs are about 50c. per ton. The total operating expenses including charges for overhead, depreciation and interest will vary from $6 to $8 per ton, depending on local conditions, and the size of the plant.

Fundamental Reasons

why the **Simonson-Mantius Process** should be used for reclaiming waste acids:

- No fumes and bad odors
- Low first cost
- Low depreciation
- Reduced operating expenses
- High efficiency
- Small floor space required

APPARATUS

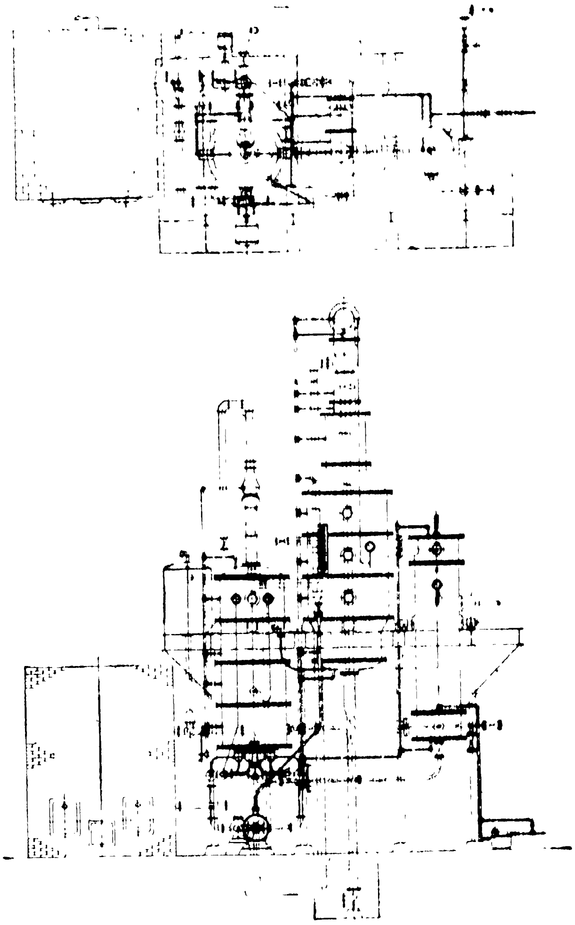
The general arrangement of a 20-ton unit is shown in illustration, and the two types of evaporators used in the Simonson-Mantius Process have been employed for many years in the chemical industry for similar purposes. There are no losses by foaming and entrainment, and all parts coming in contact with the acid are lined with heavy sheet lead by a special process. The acid is finished to 65° or 66° Bé. in an apparatus similar to the well-known Mantius High Concentrator, equipped with Duriron tubes. All accessories are especially designed for this particular work in order to reduce repairs and operating expenses.

The machinery requires only a small floor space and frequently existing buildings may be utilized. A 20-ton plant for instance will occupy only a space of about 400 square feet, and a 50-ton unit about 550 square feet.

Sludge Acid Recovery Plants working under the Simonson-Mantius Patent are built in sizes of from 5 to 50 tons daily capacity.

EXPERIMENTAL PLANT

We place at the disposal of our clients a well-equipped experimental plant, and are prepared to demonstrate and work out this process for each particular sludge acid. We require at least one barrel of separated acid for such a test, and there will be no charge for this service.



20-TON RECOVERY PLANT

WHITE ACID

In refineries where it is not desirable to use the black acid again in the process, we can furnish additional equipment that will remove the organic matter before the final concentration, and furnish a pale yellow or white acid of 65° or 66° Bé. In this case the operating expenses will be from $1 to $1.50 per ton higher.

The Simonson-Mantius Process is owned by W. H. Simonson, of the American Lead Burning Co., Inc., 30 Church Street, New York City, and Otto Mantius, of the Mantius Engineering Co., Inc., 15 East 40th Street, New York City.

THE MANHATTAN RUBBER MFG. COMPANY

EXECUTIVE OFFICES AND FACTORIES

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Birmingham, Ala
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Baltimore, Md
Atlanta, Ga
Minneapolis, Minn
San Francisco, Calif
St Louis, Mo
Cleveland, Ohio
Seattle, Wash
Spokane, Wash
Buffalo
Detroit
Tulsa,

PRODUCTS

Rubber Lined and Covered Sheet Steel Tanks, Boxes, Flanges, Nipples, Elbows and Tees—also Pipe from 1 in. up, lengths to 15 ft.

Blowers, Exhausters, Fans and Special Construction of all kinds Rubber lined and covered to order.

Belting—Drive, Conveyor, Elevator and Concentrator, including the Celebrated "Condor" Belt.

Acidproof Belts for use where Fumes Obtain.

Hose—For Water, Steam, Air, Vacuum, Oil, Chemicals, Etc.

Packing—A complete line of sheet, spiral and molded packings for every purpose; gaskets, rings, Etc.

Molded Rubber Goods—Pump Valves, Beet Sugar Specialties, Filter Press Rings, Evaporator Rings, Ball Valves, Diaphragms, Etc., and Special Parts made to order.

MOLDED GOODS AND SPECIALTIES

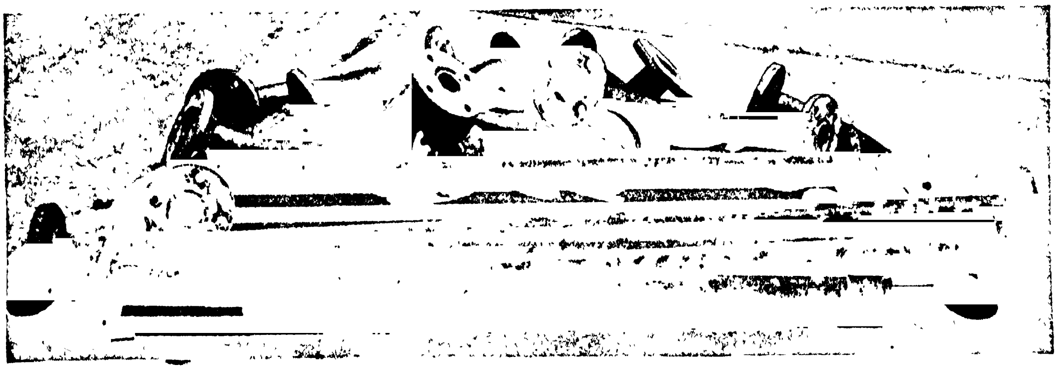
We have exceptional facilities for making rubber goods of special or irregular shape, necessitating their being made in molds. These are almost endless in variety, entering as they do into practically every industry. Estimates and samples cheerfully submitted.

RUBBER LINING

The lining of sheet steel tanks and other equipment with rubber is an operation requiring long experience and expert workmanship. We have been doing work of this character for a long time for many of the largest concerns in the chemical industries and for some of the leading manufacturers of industrial chemical equipment—for instance, we line and cover Centrifugal Baskets and line the container in which the basket revolves for several of the largest makers of these machines. Centrifugal Extractor Baskets and Tubs from 16 inches to 60 inches.

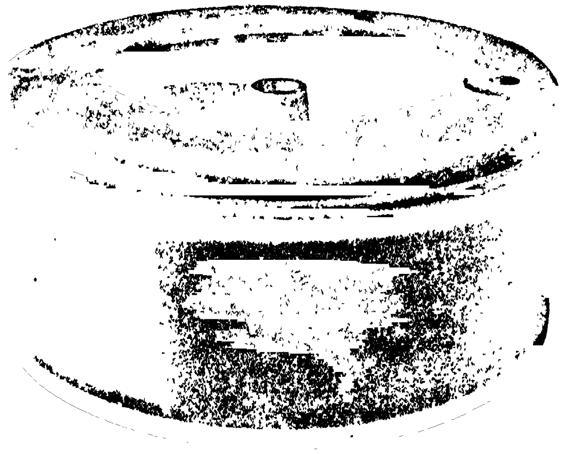
SPECIAL WORK TO ENGINEERS' DRAWINGS

We are always pleased to examine drawings of equipment of parts which chemical engineers think could be lined with rubber to advantage. We will advise as to the practicality of doing so and submit an estimate of the cost.



RUBBER LINED PIPE AND FITTINGS

RUBBER LINED AND COVERED CENTRIFUGAL EXTRACTOR BASKET



RUBBER LINED CENTRIFUGAL EXTRACTOR CONTAINER

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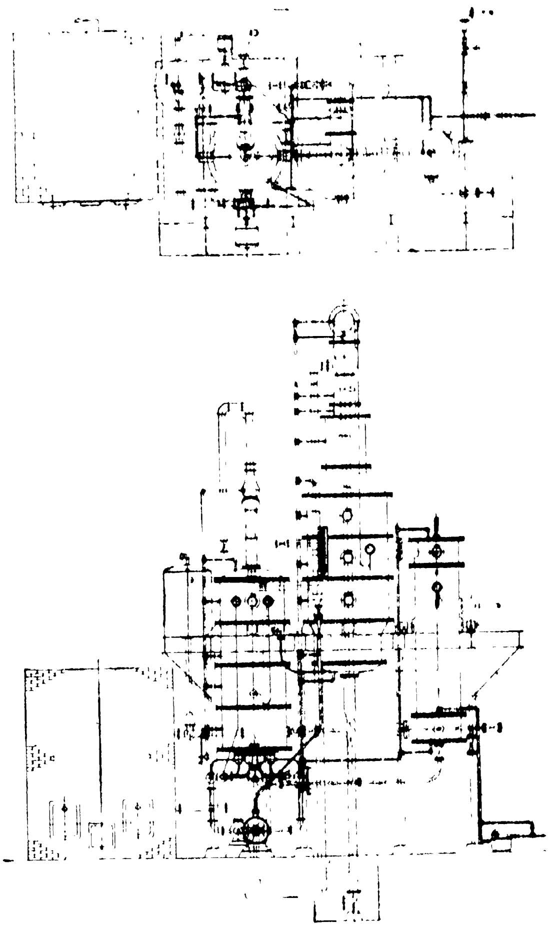

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MARSHALL RIEHA, INC.

Importers, Manufacturers' Agents, Exporters

882-884 PARK AVENUE, BALTIMORE, MD., U. S. A.

PRODUCTS

Chemical Plant and Laboratory Supplies.

BUSINESS

The business of Marshall Rieha, Inc., was established as a supply house for the chemical and allied industries of the Middle and Southern Atlantic States.

INDUSTRIAL CHEMICAL DEPARTMENT

Aluminum Sulphate. For water purification.
Barium Salts.
Bleaching Powder.
Calcium Chloride. Granular and flaked.
Caustic Soda.
Copper Salts.
Isopropyl Alcohol.
Lead Salts.
Manganese Dioxide.
Nickel Salts.
Potassium Permanganate. Technical and U. S. P.
Resorcin. Technical. "Penacol" brand.
Soda Ash.
Sodium Bicarbonate.
Sodium Sulphide. Solid fused and broken pieces.
Zinc Salts.

FINE CHEMICAL DEPARTMENT

Benzaldehyde. U. S. P.
Ethyl Ether. All grades.
  Absolute distilled over sodium.
  U. S. P.
  Marshall's Anæsthesia.
Distilled Iodine. A new product of highest purity for reagent work, supplied either in bulk or small quantities.
Phenol. U. S. P.
Resorcin. U. S. P. "Penacol" brand.
Reagent and C. P. Chemicals. Stocked and supplied in the following makes:
  J. T. Baker Chemical Co.
  Baker & Adamson.
  Powers-Weightman-Rosengarten Co.
  U. S. Industrial Chemical Co.

DENATURENT DEPARTMENT

All special formula denaturents for industrial alcohol. The materials supplied for denaturent work meet the specifications of the Treasury Department

APPARATUS DEPARTMENT

For Chemical Plants:

Centrifugal Acid Pumps for Sulphuric Acid. Types are offered suitable for all strengths and for a wide range of volume capacities. These pumps can be supplied with wearing parts of:
  Monel Metal, for weak acid.
  Hard Lead, for 50° Bé. and 60° Bé. acid
  Cast Iron, for 66° Bé. acid.
Acid Proof Cements.
Acid Proof Paints.
Acid Proof Stoneware.
"Obsidianite." An acid proof refractory.
Beach-Russ Vacuum Pumps.
Rubber Gloves, and other acid plant accessories

For Laboratories:

Balances.
Calorimeters.
"Coors" Porcelain.
Electric Furnaces.
Fused Silica Apparatus.
Gas Furnaces.
Graduated Glassware.
Hydrometers.
Laboratory Blowers.
Laboratory Vacuum Pumps.
Pyrex Glassware.
Thermometers.
"Whatman" Filter Paper.
We specialize in the supply of laboratory meta apparatus to customers' designs.

SPECIAL CHEMICAL PRODUCTS

As a result of our connections with a number o chemical manufacturers, we are frequently able to arrange for the production of special chemicals no usually marketed. We welcome inquiries along th line.

SLUDGE ACID RECOVERY

The **Simonson-Mantius Process** (patent pending) een developed after careful study of the defects xisting plants, and in this process the separated of from 30° to 35° Bé. is concentrated under high m to 65° Bé., using steam at 150 lbs pressure as ng medium, or to 66° Bé. by the use of hot oil. e low temperatures prevailing in the apparatus, tically no acid is destroyed, and **no fumes** can nto the atmosphere, as the small amount given off ng the final concentration is absorbed by the cool- water in the condenser.

The organic matter is not burned but becomes insoluble during the concentration, and if objectionable can be removed by filtration. Radiation losses are very small and fuel consumption is low on account of the acid being concentrated in a closed system at low temperature. It has been found that 65° acid with 90% acidity is entirely suitable for the chemical treatment of oils, but if necessary, the density may be raised to 66° (93% acidity) by adding a small quantity of fuming acid. Many refineries operate their boilers at 150 lbs. pressure, and therefore will not require an oil heating equipment.

OPERATING EXPENSES

A plant recovering 20 tons of acid in 24 hours requires about 25 bbls. of fuel oil, or 6.3 tons of coal, and one man can operate from one to three units at the same time if conveniently located. The power consumption does not exceed 300 K.W. hours, and repairs are about 50c. per ton. The total operating expenses including charges for overhead, depreciation and interest will vary from $6 to $8 per ton, depending on local conditions, and the size of the plant.

Fundamental Reasons

why the **Simonson-Mantius Process** should be used for reclaiming waste acids:

- No fumes and bad odors
- Low first cost
- Low depreciation
- Reduced operating expenses
- High efficiency
- Small floor space required

APPARATUS

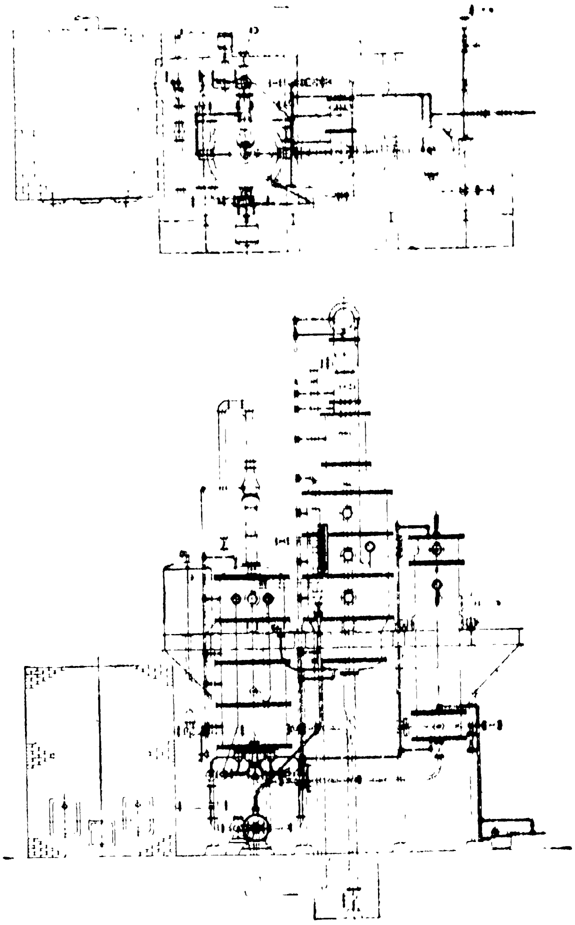
The general arrangement of a 20-ton unit is shown in illustration, and the two types of evaporators used in the Simonson-Mantius Process have been employed for many years in the chemical industry for similar purposes. There are no losses by foaming and entrainment, and all parts coming in contact with the acid are lined with heavy sheet lead by a special process. The acid is finished to 65° or 66° Bé. in an apparatus similar to the well-known Mantius High Concentrator, equipped with Duriron tubes. All accessories are especially designed for this particular work in order to reduce repairs and operating expenses.

The machinery requires only a small floor space and frequently existing buildings may be utilized. A 20-ton plant for instance will occupy only a space of about 400 square feet, and a 50-ton unit about 550 square feet.

Sludge Acid Recovery Plants working under the Simonson-Mantius Patent are built in sizes of from 5 to 50 tons daily capacity.

EXPERIMENTAL PLANT

We place at the disposal of our clients a well-equipped experimental plant, and are prepared to demonstrate and work out this process for each particular sludge acid. We require at least one barrel of separated acid for such a test, and there will be no charge for this service.



20-TON RECOVERY PLANT

WHITE ACID

In refineries where it is not desirable to use the black acid again in the process, we can furnish additional equipment that will remove the organic matter before the final concentration, and furnish a pale yellow or white acid of 65° or 66° Bé. In this case the operating expenses will be from $1 to $1.50 per ton higher.

The Simonson-Mantius Process is owned by W. H. Simonson, of the American Lead Burning Co., Inc., 30 Church Street, New York City, and Otto Mantius, of the Mantius Engineering Co., Inc., 15 East 40th Street, New York City.

MAYER TANK MANUFACTURING CO., INC.

Manufacturers of Wooden Tanks

OFFICE AND WORKS

Telephone
1909 GREENPOINT

212-220 RUSSELL STREET, BROOKLYN, N. Y.

PRODUCTS

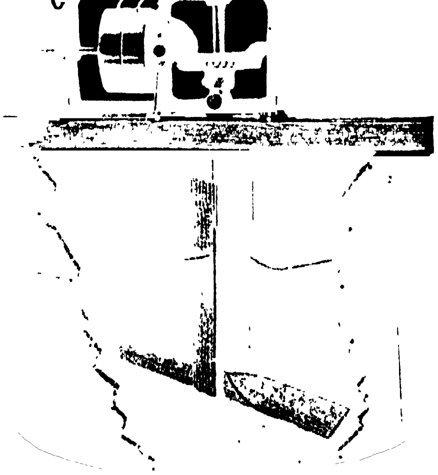
Wooden Tanks, Vats and Drums in any shape for any purpose; Round, Oval, Square, Rectangular, or special shapes for:

Chemical Plants	Color and Dye
Bleacheries	Paint and Varnish and other works
Dye Houses	
Tanneries	

MAYER ROUND WOOD MIXING TANK

Made entirely of cypress, the best wood for tanks used for most purposes throughout the chemical or other fields

Bottom of Tank—Tank built with a sloping solid bottom, the inside of bottom slopes at a sufficient angle to allow sediment to be readily removed without tipping the tank, the exterior of bottom is in an absolute horizontal plane, tank standing always in a true vertical position



MAYER ROUND WOOD MIXING TANK

Tank Walls—Cypress staves (well seasoned) vary in width from 5 to 8 inches and are held together by means of dowel pins.

Hoops—Tanks are bound with hoops of refined round iron with lug attachments. Hoops furnished as specified.

Dimensions—Mayer tanks can be made in heights of 6, 7 or 8 feet, as required; diameters range from 4 to 10 feet or larger, as desired; thickness of staves vary according to requirements—4", 3", 2½" or 2". Made in heights and widths to meet all conditions

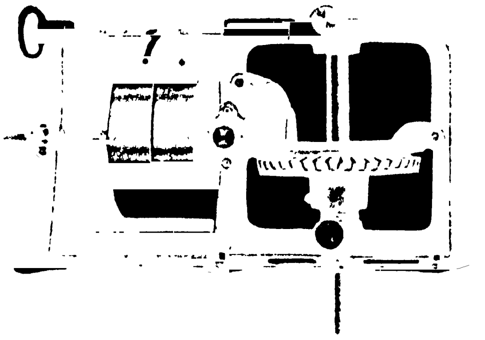
STOCKS OF WOOD FOR TANKS

We carry at all times a stock of tank lumber, Cypress, Oak, Cedar, Oregon Fir, etc

We also have a large number of Brewery tanks in stock that we can remodel to any size required, and through experience find that they answer the same purpose as new with at least a 25% saving.

AGITATORS

We build many designs of agitators used for st
or mixing liquids in wood tanks We have a de
of agitator that will handle efficiently any li
whether pasty, gummy or viscous



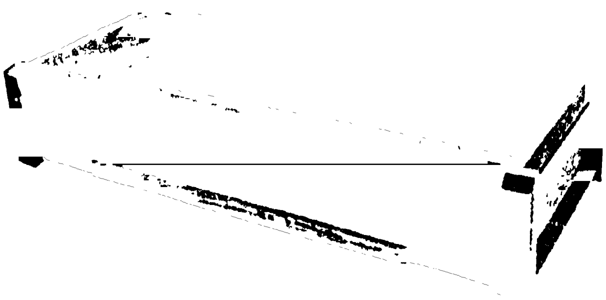
AGITATOR MECHANISM

MAYER RECTANGULAR WOOD TANKS

Made of cypress, with or without partitions, false bottoms, etc. Used for any purpose where chemicals are handled, for galvanizing work of any kind, etc

The standard rods are of refined round iron, ½ to 1" in diameter and suitable for the heaviest work, sizes of rods and spacing of same give a full factor of safety of 4 to 1 No bulging is possible.

Rods made of brass, copper, bronze, galvanized, lead-covered or other acid-resisting material, as desired.



MAYER RECTANGULAR WOOD TANK

EXPERIENCE

We have been building tanks for the industries for over 20 years, and in that time have supplied the wants of some of the largest manufacturers in the chemical and allied industries, over this long period of years

We equipped the Brooklyn plant of the National Aniline and Chemical Co. throughout, totaling about 150 tanks, of all sizes, and have executed similar large contracts for other manufacturers.

Our long experience in supplying the wants of these industries is at your service. Write us for quotations

MEAD & COMPANY

Manufacturers of the Mead Mill

DETROIT, MICHIGAN

PRODUCT

The Mead Mill, for Grinding and Pulverizing Drugs, Chemicals, Dry Colors, Dyestuffs, Sugar, Glue, Gelatine, Spices, Rosin, Asphaltum, Pitch, Asbestos, Chicle, etc.

MEAD MILL

We have specialized on this one type of mill, perfecting it in every detail until we now have what we believe is the best mill on the market from the standpoint of efficiency, durability and simplicity of construction.

Performance—Records prove that with the same number of power units consumed, our mill will grind a larger volume of material in a shorter space of time than any other mill on the market.

Simplicity—Owing to the simplicity of construction there is practically no danger of the Mead Mill getting out of adjustment.

Description—This grinder is the high-speed disc type reducing the materials by impact, a vast improvement over the friction method. A Jesop steel disc bears hand-forged tool steel beaters which revolve inside corrugated rings. These beaters catch the material as it enters the feed side and beat it against the corrugations until it is fine enough to pass between the disc and the ring. The material is then on the discharge side of the machine, and all that is fine enough is forced through the screens by the beaters on the back of the disc. The remaining material is caught up by the back beaters on disc and beaten against the screens until it is fine enough to pass through. The ground material is discharged through the opening in the bottom of the mill into a discharge box, hopper, or into the room below.

Screens and Blanks—For each size mill we make three grades of screens—fine, medium and coarse. Two sections of screen are placed in the groove in the lower half of the mill, and a screen and a blank in the upper half of the mill, thus completing circle around revolving disc. The blank is corrugated but has no openings, and is used to retain the material in the mill longer, thus increasing the degree of fineness.

Fineness of Grinding—The degree of fineness to which the material can be ground depends first on the speed of the mill, and the number and kinds of screens used.

Materials Ground—The Mead Mill will grind practically any material desired. It can be arranged to grind gummy, sticky, soft materials. It is used largely in grinding gum chicle.

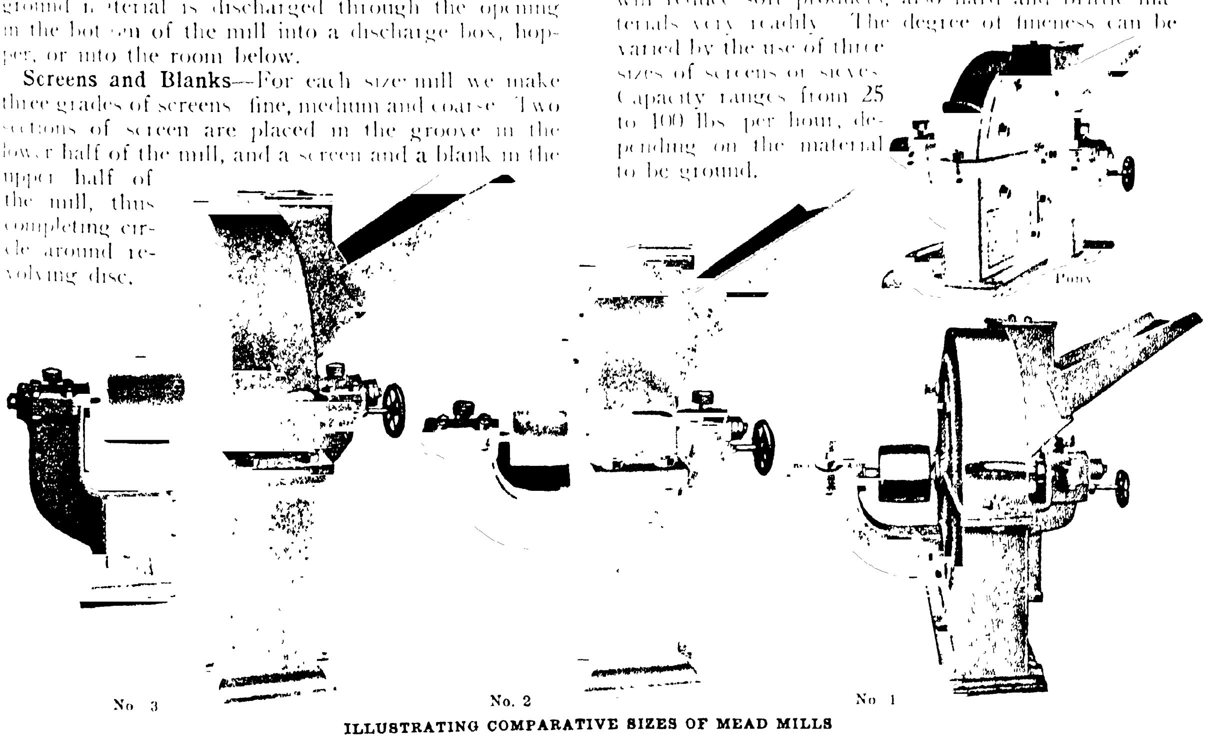
Interchangeability—All Mead Mills of one size are alike, with interchangeable parts. One of the strongest features of our mills is the fact that duplicate parts can be obtained at short notice. As the beaters are the most liable to wear, by providing a spare disc, the disc can be quickly replaced, thus stopping the mill for a minimum of time. We have special machinery for making and drilling the beaters uniformly and can furnish them ready to attach.

DATA OF MEAD MILLS

[illegible]

Mill	Dimensions			Horsepower required	Speed R.P.M.
	Length	Width	Height		
Pony	[illegible]	[illegible]	[illegible]	1	[illegible]
No. 1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
No. 2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
No. 3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Pony Mill—This little mill was designed to meet the universal demand for a perfect laboratory and small production grinding and pulverizing mill. This mill will reduce soft products, also hard and brittle materials very readily. The degree of fineness can be varied by the use of three sizes of screens or sieves. Capacity ranges from 25 to 100 lbs. per hour, depending on the material to be ground.



Pony

No 3 No. 2 No 1

ILLUSTRATING COMPARATIVE SIZES OF MEAD MILLS

RICHARD K. MEADE & CO.

Chemical and Industrial Engineers

11 E. FAYETTE ST., BALTIMORE, MD.

ANALYTICAL LABORATORY 11 Clay St EXPERIMENTAL PLANT: Yorktown, Va

SERVICES

Design and Construction of Lime Plants, Cement Mills; Plaster Plants; Fertilizer and Chemical Works; Lithopone and Potash Plants.

Design and Installation of Rotary Kilns; Chemical Furnaces; Complete Oil and Pulverized Coal Burning Systems; Crushing, Grinding and Pulverizing Plants; Material Handling and Storage Systems; Drying Systems and Dust Precipitation Apparatus.

Reports (Covering fiscal as well as technical possibilities) upon mineral deposits, processes, etc.

Chemical Research and Investigation on a semi-commercial scale of new processes.

GENERAL

We offer the chemical industries an organization skilled in design and construction, combined with expert chemical knowledge.

We undertake all work connected with the building of plants including preliminary studies, layouts and estimates, complete detail plans and specifications for the erection of such plants and instructions for their operation.

Plants and Equipment designed by us are especially adapted to meet specific requirements. We believe that only after a thorough study of the problem can best results be obtained.

We maintain complete research laboratories and an experimental plant.

LIME, HYDRATED LIME AND PLASTER PLANTS

We design lime kilns for burning coal, oil, or producer gas; of vertical (steel or reenforced concrete construction) or rotary type, and complete hydrated lime and plaster plants. Our design is always based on local conditions and a careful study of the raw materials and the character of the product desired. As a result of this study our plants are efficient, because the equipment we recommend is exactly suited to the requirements.

We make a specialty of plants for recovery of lime from waste carbonate of lime from caustic soda, paper pulp, etc.

PORTLAND CEMENT MILLS

Our work in this industry, with which Mr. Meade's name is so intimately connected, consists in the design and construction of new plants, remodeling and enlargement of old plants, investigation of deposits of raw material and expert advice as to improvement of product or increase and economy of production.

ROTARY KILNS AND INDUSTRIAL FURNACES

We have designed installations for roasting or nodulizing copper concentrates, flue dusts, ores a findings; desulphurizing and nodulizing iron ores and pyrite cinder; for making various chemicals.

We are in a position to demonstrate and work on these processes in our experimental 2′ diam. x 20′ long rotary kiln.

We also specialize in muffle, reverberatory and rotary batch furnaces for chemicals such as barium sulphide, lithopone, bichromate, muriatic acid, silicate of soda, etc.

PULVERIZED COAL AND OIL BURNING SYSTEMS

We have had twenty years' experience in the use and application of pulverized coal and oil to heating industrial furnaces, boilers, etc.

We are always glad to advise manufacturers as to the heating of their equipment.

DRYING SYSTEMS

We are prepared to make a study of drying problems and to design dryers especially suited to various materials. We have designed dryers of all types, direct, indirect, closet, tunnel, air, etc.

CRUSHING PLANTS

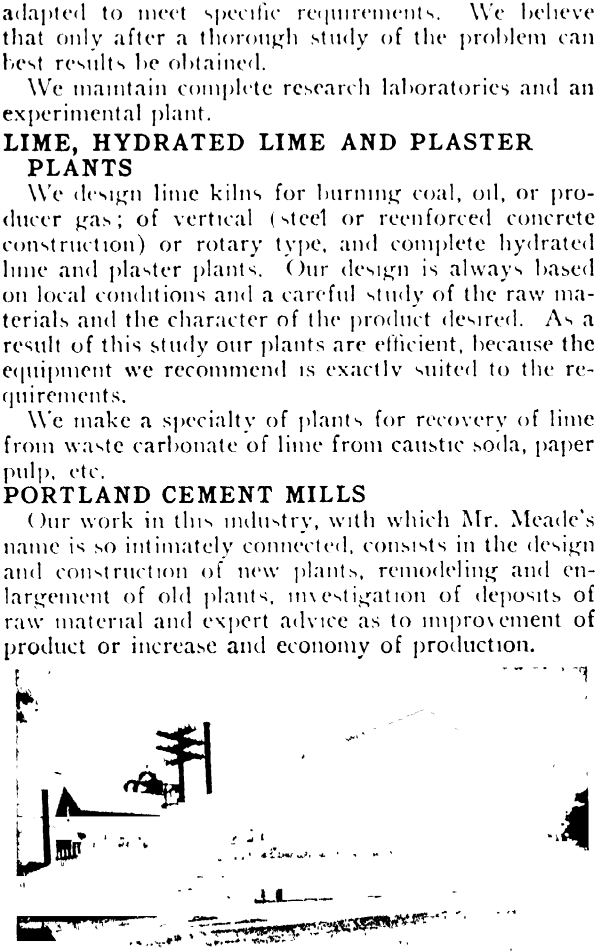
We make a specialty of plants for crushing ores, minerals, granite, trap rock, limestone, etc., and for pulverizing limestone for agricultural purposes, feldspar for pottery, ores, gypsum, talc, etc.

MISCELLANEOUS

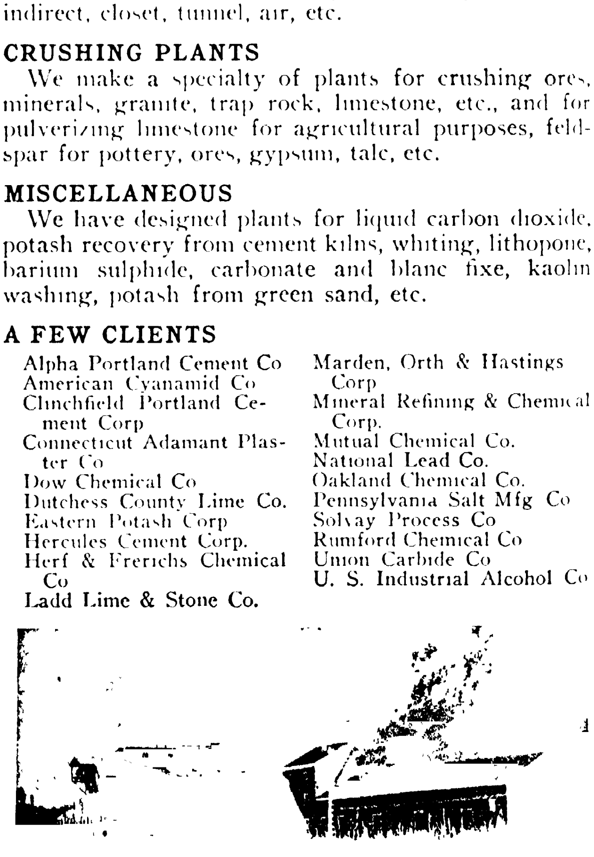
We have designed plants for liquid carbon dioxide, potash recovery from cement kilns, whiting, lithopone, barium sulphide, carbonate and blanc fixe, kaolin washing, potash from green sand, etc.

A FEW CLIENTS

Alpha Portland Cement Co
American Cyanamid Co
Clinchfield Portland Cement Corp
Connecticut Adamant Plaster Co
Dow Chemical Co
Dutchess County Lime Co.
Eastern Potash Corp
Hercules Cement Corp.
Herf & Frerichs Chemical Co
Ladd Lime & Stone Co.
Marden, Orth & Hastings Corp
Mineral Refining & Chemical Corp.
Mutual Chemical Co.
National Lead Co.
Oakland Chemical Co.
Pennsylvania Salt Mfg Co
Solvay Process Co
Rumford Chemical Co
Union Carbide Co
U. S. Industrial Alcohol Co



PLASTER PLANT, CONNECTICUT ADAMANT PLASTER CO., NEW HAVEN, CONN.



LIME KILNS AND HYDRATING PLANT LADD LIME & STONE CO., CARTERSVILLE, GA.

MEIGS, BASSETT & SLAUGHTER, INC.

Chemical Engineers

210 South Thirteenth Street

PHILADELPHIA, PA.

Cable Address
"CHEMENG" Philadelphia

SERVICES

"From Research to Plant in Operation."

Specialists in the design and construction of Sulphuric Acid, Nitric Acid, Muriatic Acid, Phosphoric Acid Plants and plants for the production of Potash and Fertilizer Salts. We are prepared to furnish expert engineers for the superintendence of construction and can also supply men thoroughly trained in the operation of such plants.

Industrial reports as a basis for financing.

CONSULTING ENGINEERING SERVICE

We have nothing to sell but our services and act as consulting engineers from "research to plant in operation." We have a large and well trained corps of engineers and chemists who are familiar with all branches of chemical industry but have specialized in the heavy mineral acids and chemical salts.

If you will submit us your problems, we will be glad to investigate their possibilities through our research department, perfect the process, and design a suitable plant to carry out the operation, instructing your operators in the work.

Our research laboratory at Bala, Pennsylvania, is fully equipped to handle problems relating to the investigation of acids, alkali salts, salt separation, cotton purification and caustic recovery, cotton nitration, lacquers, celluloid, artificial leathers, etc.

We have a complete furnace equipment for roasting problems together with leaching and evaporating for the manufacture and recovery of metal salts as sodium sulfide, barium carbonate and strontium salts.

WORK COMPLETED

Typical of the work recently done by this company we mention the following:

Industrial Survey and Complete Report on the Old Hickory Powder Plant as a basis for its development as an industrial center.

Thorough exploration, tests, development of processes and complete report on two large potash developments.

Design and Construction of

60 Ton Contact Sulphuric Acid Plant.

6 Retort Nitric Acid Plant.

Complete 9 Wringer Cotton Nitrating Plant.

Complete Artificial Silk Plant for manufacture of 10,000 pounds daily with ether-alcohol, collodion mixing, filtration, spinning, twisting and skeining, denitration, solvent recovery, power plant, etc.

MERRICK SCALE MANUFACTURING CO.

The Weightometer

PASSAIC, NEW JERSEY

PRODUCT

The Weightometer for automatically weighing and registering the weight of all material in transit over a belt, bucket or pan conveyor.

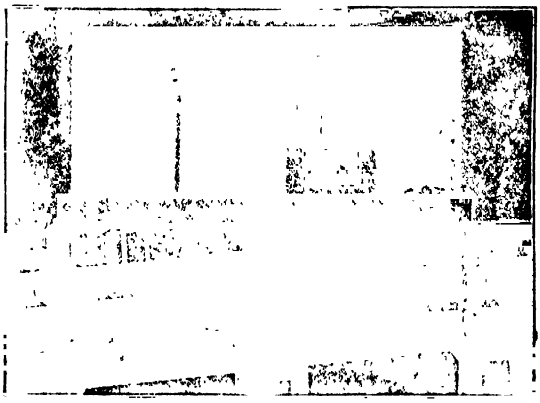
DESCRIPTION

The Weightometer consists of a pair of weighing levers, and a steelyard or beam, similar to that of the platform scale, but of special design, so that a short section of the conveyor can be suspended from the weighing levers. The load on this suspended portion, however distributed, is always automatically counterbalanced by the buoyancy of a cylindrical iron float immersed in a mercury bath and suspended from the long end of the weighing beam. This float allows the beam to move from its position, when the conveyor is empty, in exact proportion to the weight of material on the suspended portion of the conveyor at any moment. A mechanical integrator totalizes the movement of the beam, with a factor obtained from the travel of the conveyor by means of suitable gearing from the bend pulley or sprocket wheel. The result obtained from the product of two quantities, one proportional to the weight of the material suspended and the other to the travel, therefore represents accurately the total weight of material moved. This is plainly indicated, by a register, in units and decimals of either a short ton, long ton, metric ton or other desired units.

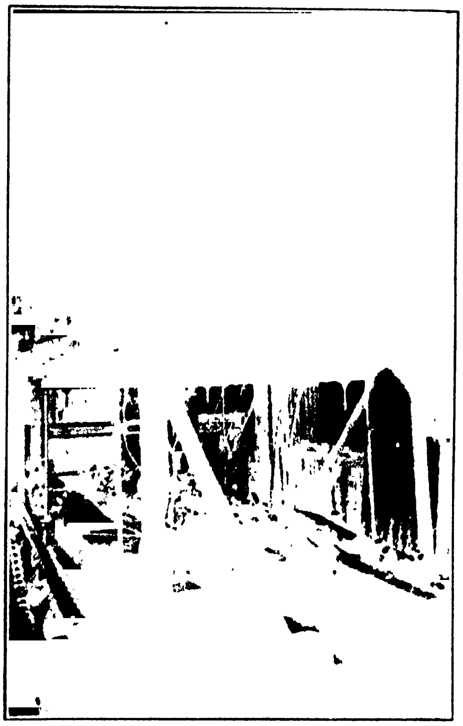
ACCURACY

This company guarantees, when this machine is erected and operated in accordance with instructions, that the accuracy shall be within 99% of the actual weight of material carried over the conveyor at a rate of not less than one-half of the maximum capacity for which the Weightometer is designed. This is not limited to a uniform continuous load, as portions of the conveyor may be loaded to full capacity of the Weightometer with empty portions intervening.

In testing, at least sufficient material must pass over the conveyor to register 5 or more unit figures on the counter.



VIEW OF WEIGHTOMETER ON BELT CONVEYOR
Front Sheet of Casing Removed



TYPICAL INSTALLATION OF MERRICK CONVEYOR WEIGHTOMETER

USE

Wherever a conveyor can be used to convey bulk material, a Weightometer installed on this conveyor will weigh on the fly all of the material which passes.

Chemical, Cement, Power, Gas Plants, Paper Mills, Mines, Stone Quarries, weigh their raw and finished product, using the Weightometer weights for production and consumption records as well as for checking in and billing out weights.

REGISTRATION

Weight to be registered by 5-figure counter in tons of 2,000 lbs. and decimal thereof, unless otherwise requested. Registration can be made in other units, as long tons, metric tons, barrels of a certain number of pounds, etc.

ESSENTIAL FEATURES

The important advantages of the Merrick Weightometer are: easy installation; automatic operation; no expense for attendance; durability; simplicity; sheet iron enclosure for all working parts, thereby eliminating exposure to dust and interference by tampering; weighing without interruption of conveyor service, and a high degree of accuracy, whether the load be intermittent or uniform.

THE MERRILL COMPANY

GENERAL OFFICES
121 SECOND STREET, SAN FRANCISCO, CALIF.

EASTERN OFFICE
50 Church Street, New York, N Y

FACTORY AND GENERAL EASTERN SALES OFFICE
Monadnock Building, Chicago, Ill

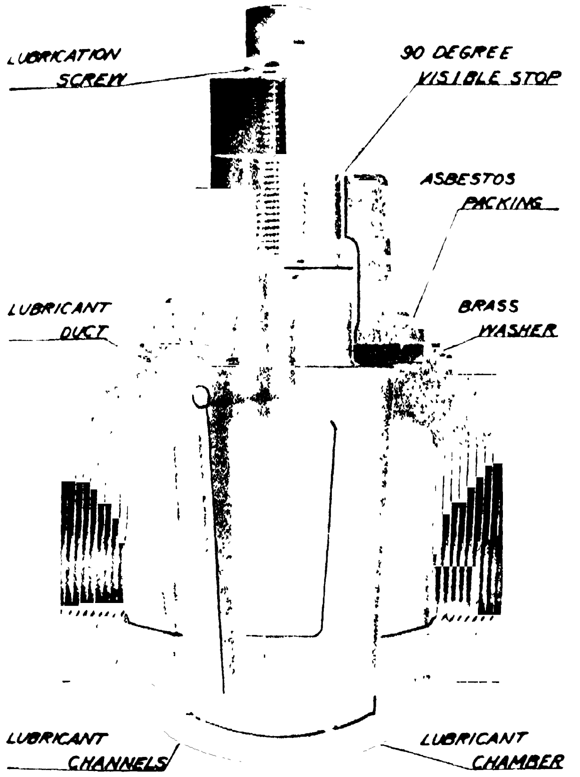
SALES OFFICES
Cleveland
Detroit
Kansas City
Minneapolis
Philadelphia
Pittsburgh
Saginaw
St. Louis
And other cities

PRODUCT

The **Merco Nordstrom Plug Valve.**

DESCRIPTION

e general construction and characteristics of the co Nordstrom Plug Valve will be evident from a of the accompanying illustration



CROSS SECTIONAL VIEW MERCO NORDSTROM PLUG VALVE

The basic principle of the Merco Nordstrom patent is the combination in a plug valve of lubricant conduits and a lubricant chamber at the base of the plug so positioned that when pressure is applied to the lubricant screw, this pressure is transmitted to the chamber at the base of the plug and operates to lift the plug from its seat and simultaneously to distribute lubricant over the bearing surfaces. A flexible packing is provided between the cover and the shoulder of the body and plug of the valve. This packing furnishes the necessary elasticity to allow the plug to be forced from its seat for the purposes of lubrication and to force the plug back into its seat when the pressure in the lubricant chamber is released.

A visible stop is cast as an integral part of the plug and cover and is so positioned that the lubricant channels can never be exposed to the fluid passing through the valve. This stop assures that the valve is fully open or closed and makes it impossible for the operator to become confused regarding the position of the valve.

From the principle of construction it is evident that no matter how firmly the plug may be stuck to the valve, when force is applied to the lubricating screw, enough pressure can be created in the grease chamber to raise this plug from its seat, to separate the metal to metal contact and cause the plug to be free operating.

Merco Nordstrom Plug Valves are so designed that the opening in the plug is equal to the nominal area of each individual pipe size, in other words, a full "100% opening." Furthermore, we also use a solid parallel opening through the plug to minimize friction and to increase the life of the valve. We are sure that both these points will appeal particularly to engineers using valves.

Owing to the lubrication employed, the Merco Nordstrom Plug Valve operates very easily even in the larger sizes. The 6″ and 8″ valves, for instance, are readily operated with a 30″ wrench, and the 12″ size turns freely with a 48″ wrench.

Since wear and corrosion are reduced to a minimum by the protective coating of lubricant on the bearing surfaces, the Merco Nordstrom Plug Valve will remain tight even under the most severe conditions of service. A very small amount of lubricant is needed for the proper operation of the valve. In ordinary service, for valves which are operated four to six times daily, one cartridge of lubricant per month is sufficient to keep the valve in perfect condition.

Lubricant is supplied in convenient stick form that fits loosely into the shank of the plug when the lubricant screw is removed. Four grades of lubricant are carried in stock as follows:

No 1	Intended for use with general solutions at 100°F
No 2	Intended for use with steam (boiler blow-off) and general high temperatures up to 750°F
No 3	Intended for use with organic solvents, oils, gasoline, coal tar products, etc
No 4	Intended for use with fluids strongly chemically reactive, as oleum, caustic, chlorine, etc, at temperatures up to 300°F

All of the above lubricants contain special high grade lubricating graphite. For food work and in special cases the lubricants are furnished without the graphite. Information is especially requested from customers regarding service intended so proper lubricant can be sent with the valve.

Merco Nordstrom Plug Valves will be found particularly adapted for use upon hard services demanding exacting conditions as are met in general industries. In the oil refinery upon loading racks, pipe lines, stills, retorts, chemical solutions, light oils, etc. In handling or manufacture of general chemicals as acids, caustic, alkali, bleach, crystallizing salts, corrosive gases, etc. In the power house as throttle valve, boiler blow-off cock, soot blower, oil burner regulator, vacuum or pressure operating either on oil, gas or solution. Wherever a valve is needed that has long life and positive action, where scale, grit or suspended solids are handled freely, and that **Won't Stick and Won't Leak,** the Merco will answer every requirement.

METAL FABRICS COMPANY

Manufacturers of

Wire Fencing and Wire Belting

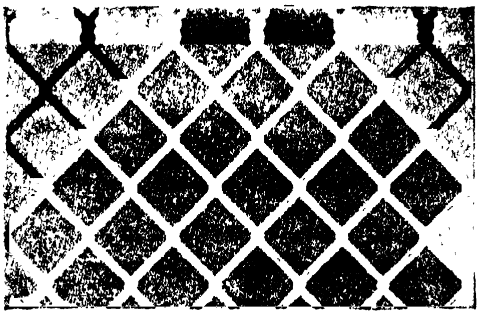
FACTORY
Keyport, N. J.

MAIN OFFICE
34 CLIFF STREET, NEW YORK, N. Y.

PRODUCTS

Wire Fabric Fencing for industrial plants.
Wire Belting.

FENCING


LINKED WIRE FABRIC

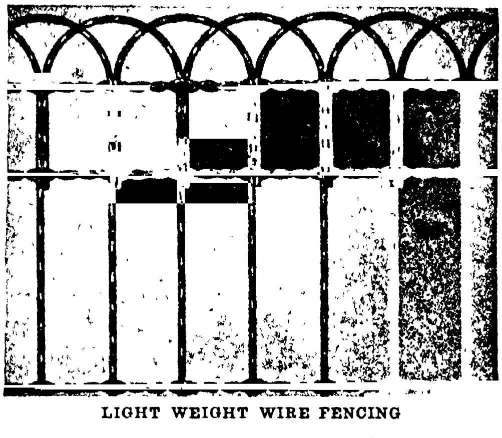
The necessity of a sturdy life-long fence surrounding the plant or factory is recognized everywhere. Wire fencing as compared to wood fencing is safe, has a neat appearance and long life. It is free from fire risk, as there is no accumulation of refuse along the base of the fence; a watchman at the fence-gate is all that is needed to prevent intrusion from outsiders.

We manufacture many useful designs that are at the same time artistic and will meet every requirement of a specification.

LINKED WIRE FABRIC FENCE

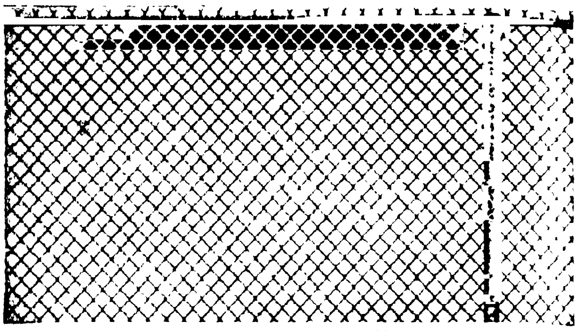
This fencing has the strength to withstand any unusual strains or stresses. It will stand the expansion and contraction due to the weather.

We buy our wire for manufacturing fences in such large quantities that uniformity of the wire throughout is assured.


LIGHT WEIGHT WIRE FENCING

LIGHT WEIGHT WIRE FENCING

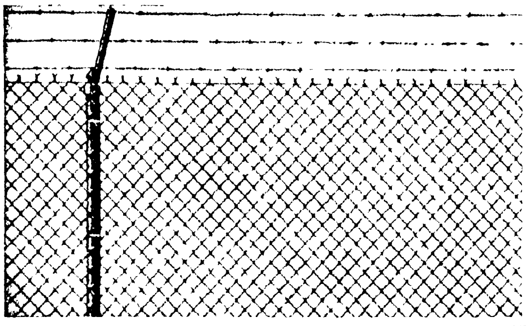
This class of fencing is used wherever a protection is necessary for grass plots, or athletic fields in connection with the welfare department of large industrial plants.

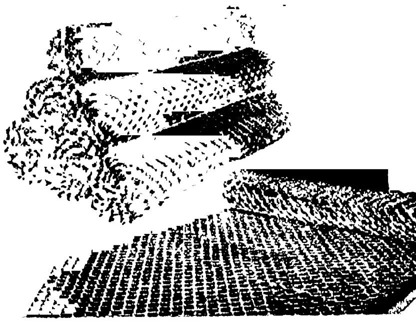

TUBULAR STEEL CONSTRUCTED FABRIC FENCING

TUBULAR STEEL CONSTRUCTED FABRIC FENCING

This reinforced sturdy fencing is built by us for situations where the fence runs close to outside stock bins, and work yards, such as steel mills, iron foundries, machine shops, steel plate fabricating shops, etc. Bulk materials falling or resting against this fencing will not stretch it out of shape as it has great resistance.

The illustration below shows our Tubular Steel Constructed Fabric Fencing with the extension arms and barbed wire for added protection against fence climbing. This style is in large demand for manufacturing plant enclosures.


TUBULAR STEEL CONSTRUCTED FABRIC FENCING WITH BARBED WIRE PROTECTION

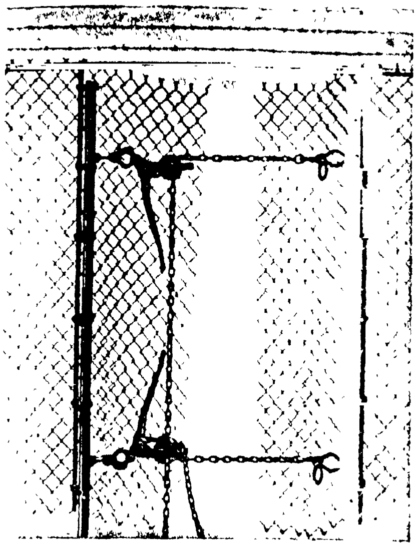

ROLL OF FENCING READY FOR SHIPMENT

SHIPMENTS OF CHAIN LINK FENCING

Our method of shipping fencing is illustrated above. The rolls are compact and of uniform length. Each

Continued on Next Pag

an be easily attached to the end of another roll by s of spare wires shaped to the weave of the fence. se wires are supplied with the rolls.



METHOD OF TIGHTENING OUR FENCES

INSTALLATION OF OUR FENCING

While we give buyers of our products full instructions how to erect the fencing, we suggest that we send our own workmen to install the fence. This is done with the idea that the best fence when poorly installed, shortens its life a great deal. If too tight it will bulge at some point, and if too loose it will sag and get out of alignment. Our method of installing the fencing is shown here.

FLEXIBLE BELTING

We specialize in flexible belting for various purposes and would be pleased to have conveying problems submitted to us for solution.

The advantages of flexible belting are as follows

It possesses sufficient strength to act as a drive belt as well as a conveying belt.

It may be made in any width without a break.

It can be made in any length without lacing or other joint.

A piece of any size may be taken out or inserted at any point without in any way affecting the character of the belt.

It can be made in any mesh, from the fineness of a lady's mesh bag to as coarse as may be desired.

It may be made from any size wire from the finest up to ⅜" rod if required.

It may be made of any kind of metal necessary to resist the action of various materials.

It may be used on any size of pulley as its flexibility conforms to the surface and still gives sufficient traction.

It is very much cheaper than any other belt of similar utility.

It may be used for drums containing pins or other irregularities.

Its openings permit the free passage of steam, hot air, water or other substances, which are necessary in some classes of manufacture.

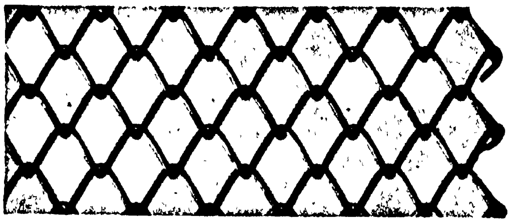
Repairs can be made at trifling cost by inexperienced workmen. As this consists simply of replacing defective wires with new wires, the belt is made exactly like new. These repair wires can be kept on hand at slight expense.

Promptness of delivery could be assured as the same machine could make a wide variety of meshes

May be used for conveying and screening simultaneously

We illustrate a few of the innumerable types of belting which we manufacture

Detailed information will be sent upon request



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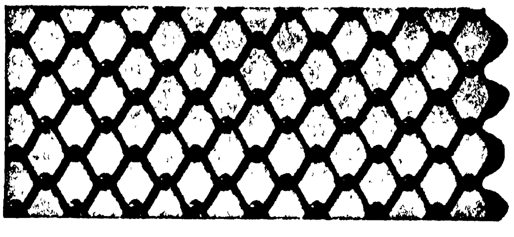

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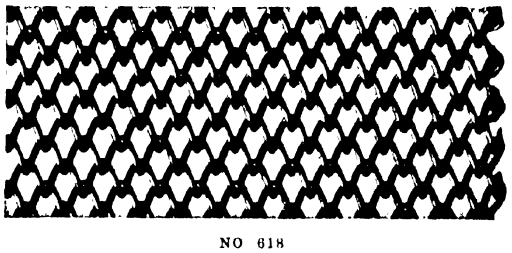

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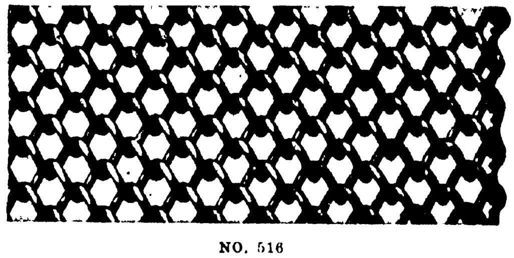

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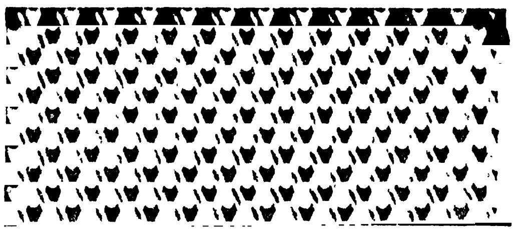


NO. 616

FULL SIZE ILLUSTRATIONS FLEXIBLE WIRE BELTING

NOTE The coarsest mesh shown above is three openings to the inch We can furnish any larger mesh, however, up to six-inch opening and any gauge wire required

THE MICHIGAN PIPE COMPANY

Combination Steel and Wood Pipe,
Creosoted Wood Conduits, Steam Pipe Casing

BAY CITY, MICH.

BRANCH OFFICES

Chicago, Insurance Exchange Bldg
Boston, 93 Broad St
New York, 30 E 42nd St

Cleveland, 919 Ulmer Bldg
Oklahoma City, 14 N Dewey St
Philadelphia, 318 Widener Bldg

Chattanooga, 702 James Bldg
Montreal, 201 St James St

PRODUCTS

"Michigan" Combination Steel and Wood Pipe
"Michigan" Steam Pipe Casings
Creosoted Wood Conduits.

USES

"Michigan" Pipe in its various forms is used extensively for

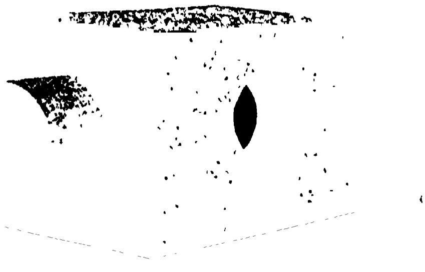
Acids and Gases in Chemical Plants
Acidulous and Sulphurous Water
Hot Slops in Distilleries
Liquors in Tanneries
White Water and Pulp in Paper Mills
Water and Culm in Mines
Heavy Fluids containing Grit, etc
Ventilating lines and stacks for Gas and Acid Fumes
Hydro-Electric Plants

Conveying water, in connection with municipal supply and distribution systems, mines and railroads, flumes, irrigation projects, gravity and pressure feed water lines for mills and factories; for return water in connection with heating plants.

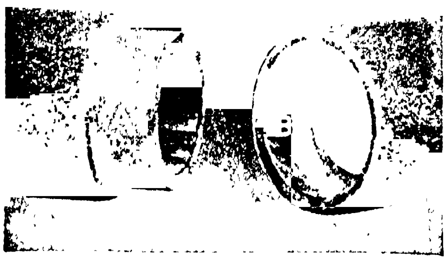
SECTION OF "MICHIGAN" ACID PIPE SHOWING BANDING AND COATING

ADVANTAGES

Less expensive than iron and steel pipe.
More durable for chemical use.
Less expensive to install
Greater carrying capacity than metal pipes.
Non-freezing.
Not affected by electrolysis.
Easily tapped for connections
Nothing but wood in contact with liquid conveyed.



ACIDPROOF WOOD ELBOWS AND TEES



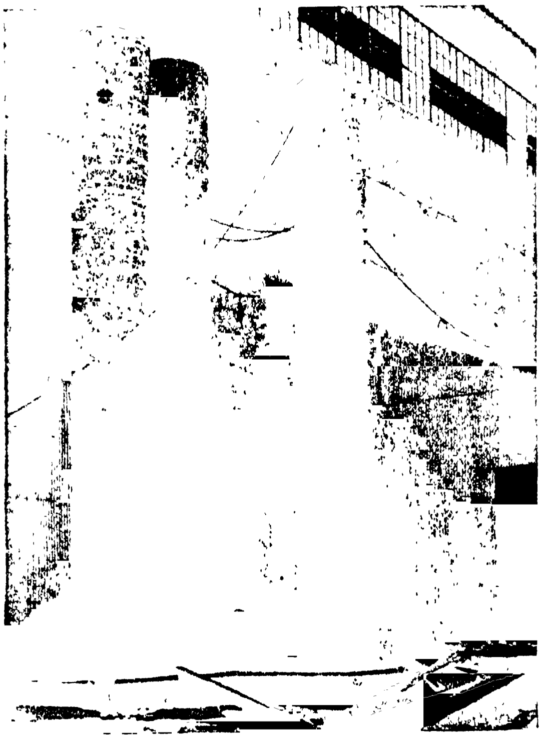
THE ALL WOOD JOINT

SERVICE

Skilled engineers furnished to lay out lines, furnish estimates and install "Michigan" pipe.

SHIPMENT

Our facilities enable us to make immediate shipment from stock



"MICHIGAN" ACID FUME TOWERS
Jarecki Chemical Company Plant, Cincinnati, Ohio

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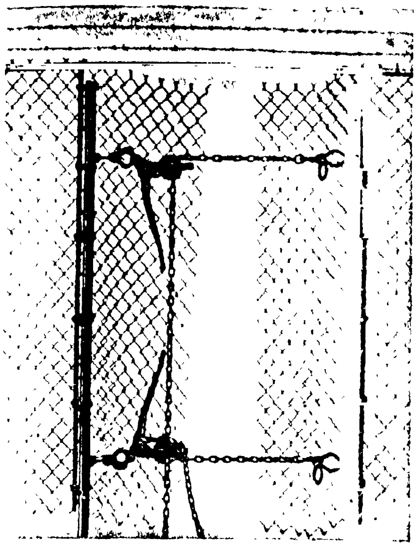

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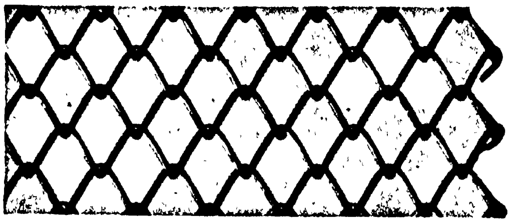

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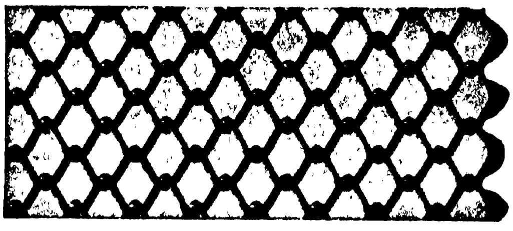

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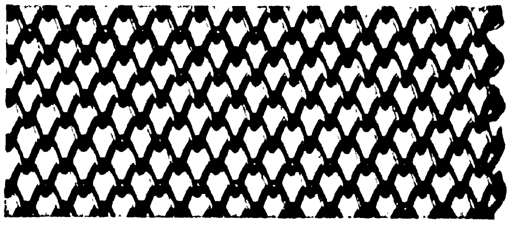

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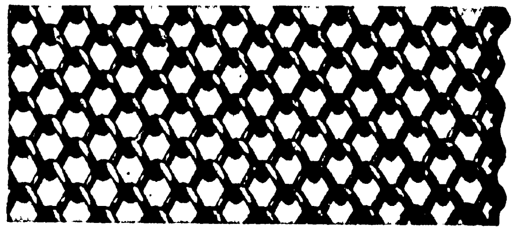

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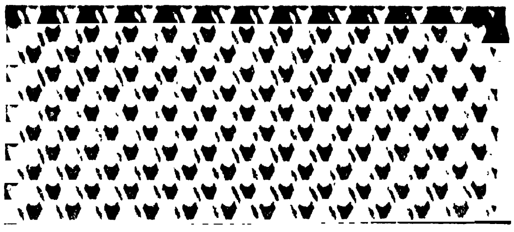

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THE MINE & SMELTER SUPPLY CO.

Ore Dressing and Milling Machinery; Mining Machinery and Supplies
Machinery, Apparatus, Scientific Instruments, Chemicals,
Electrical Goods, General Supplies and Equipment

DENVER SALT LAKE CITY EL PASO

42 BROADWAY, NEW YORK, N. Y.

Large Supply Depots at Denver, Salt Lake City and El Paso

PRODUCTS

Sole manufacturers of the Wilfley Concentrating Table, Marcy Ball Mill and Marcy Roller Mill.

Sole selling agents for Dourte Valveless Pumps, Sackett Sand Pumps, Heusser Balances, Samson Laboratory Crushers, Ruth Laboratory Flotation Machines, Colorado Clay Goods and Furnaces, McCool Pulverizers.

BULLETINS

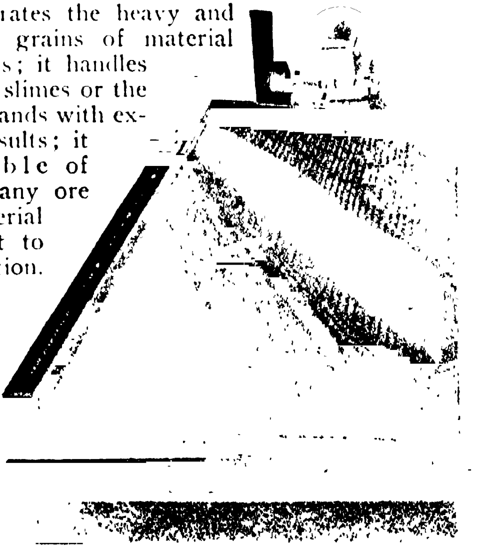
Complete bulletins published for each of our principal products listed here, in addition to large general catalogs of Mill Supplies, Electrical Goods, and Assayer's and Laboratory Equipment and Supplies.

THE WILFLEY TABLE FOR CONCENTRATION

More than 20,000 Wilfley Concentrating Tables in use in the largest plants all over the world testify to the enormous success and deserved popularity of this table.

The table is a mechanically operated end-wise reciprocating table consisting of a self-oiling enclosed type of head motion, a deck having a plain surface partly riffled and partly unriffled and an understructure and tilting device.

It separates the heavy and the light grains of material into bands; it handles the finest slimes or the coarsest sands with excellent results; it is capable of dressing any ore or material subject to concentration.



A WILFLEY IN ACTION

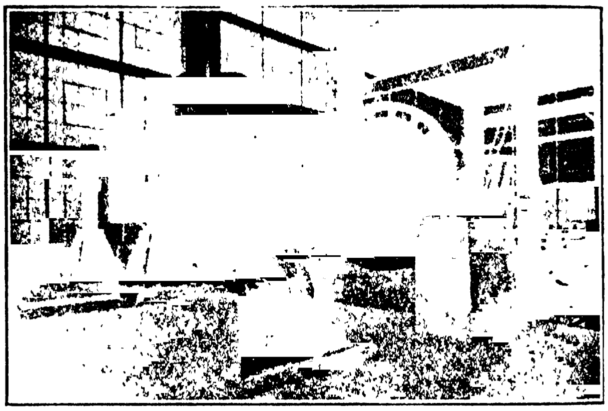
The head motion has a differential movement which gives the greatest travel to the material with the least amount of external agitation. The light, rigid deck, moving in a perfectly horizontal line, is provided with riffles adjusted so that the gangue or waste material will be eliminated all along the table from end to end. The discharge end has sufficient riffle capacity to hold and discharge all concentrates and yet eliminate the gangue.

Bulletin No. 64 fully describes the various types of Wilfley Tables.

MARCY ROLLER MILLS

The Marcy Roller Mill will take a 1″ crusher feed and in one pass of the mill will produce a very uniform product of 8, 10, 14 or 20 mesh which is so essential for good table extraction. This machine is especially desirable for regrinding work.

Experiments were started with the Marcy Roller Mill in January, 1917, and the work has been carried on continually to date. The purpose of the experiments was to develop a rod mill of the highest efficiency having as its paramount feature the minimum cost of crushing.



MARCY ROLLER MILL ON TEST FLOOR

To get the best grinding results from rods it is well recognized that we must have:

1. A heavy, slowly revolving rod mass.
2. A low pulp line or a small amount of pulp in the mill.
3. A practical way to remove broken rods worn as small as ⅝″.

The Marcy Roller Mill is made to meet these operating conditions. It is built along good engineering lines and particular attention has been given to the strength and the wearing qualities of the material used It has an open end feature, by means of which a low pulp line is maintained and through which the rods can be removed and any new ones replaced with ease It is so designed that rods stay in the mill.

Descriptive bulletin of Marcy Roller Mills upon request.

THE MARCY BALL MILL

The Marcy Ball Mill, which will take a 2½″ feed, is a wet crushing ball mill having almost the entire discharge end fitted with grates. Between the grate and the end of the mill there are arranged lifters which act as a pump to lift the product so it will be discharged

Continued on Next Pag

ugh the discharge trunnion of the mill. The water eed enter the mill through the feed trunnion, conntly there is a difference in elevation between eed as it enters the mill and the point of discharge gh the grate. The water, therefore, causes a ng action which quickly carries the fines and

LARGEST BALL MILLING PLANT IN THE WORLD
The mills are Marcy Ball Mills

slimes through the grate, then to the lifters and out through the trunnion or discharge end of the mill. This method of operation relieves the mill of a bulky mass of pulp and causes the fines to migrate faster than the coarse particles. It also increases the relative weight of the balls that would otherwise be under the influence of the buoyant effect of the pulp.

APPROXIMATE MARCY BALL MILL CAPACITIES

Size Mill	Tons 24 Hrs -8 Mesh	Tons 24 Hrs -20 Mesh	Tons 24 Hrs -35 Mesh	Tons 24 Hrs -48 Mesh	Tons 24 Hrs 65 Mesh	Tons 24 Hrs 100 Mesh
No 32	20	15	12	10	7	4
No 43	50	38	30	25	18	11
No 54	90	68	52	45	32	18
No 64½	300	225	180	150	105	60
No 75	655	490	390	325	230	130
No 86	1000	750	600	500	360	200

The product of the Marcy Mill is nearly non-selective. By non-selective is meant a product in which the mineral has not been subject to a classifying action, nor has it become over-crushed as compared with the gangue. Whereas, in the operation of all classes of overflow trunnion discharge mills, there is a vertical gravity classification of the mineral from the gangue. That is, the mineral being heavier, is carried lower or next to the periphery and consequently ground up into undesirable product.

For more complete information write for Bulletin No. 62.

HEUSSER BALANCES

The most perfect and the most complete Precision Balances produced by the Instrument Maker's Art.

Manufactured exclusively for The Mine & Smelter Supply Company.

These highly-successful balances have been used and recommended during the past fifteen years by Assayers, Chemists and Scientific Research Workers the world over. They have been recognized as instruments of superior qualities possessing many valuable, unique and distinguishing features which are briefly described below.

All Metal Balance Casing—Combining elegance of appearance with great mechanical strength; is absolutely proof against all climatic conditions, magnetic disturbances and electrical influences. It admits an unusually large amount of light and except through violent accidents it is practically indestructible.

Unit Base and Releasing Mechanism—Forms a compact unit of all the working parts. This construction maintains the perfect alignment and adjustments of all parts during transportation and in service.

Beams Are of the Trussed Form Combining maximum of rigidity with minimum of weight. All beams are direct reading and are warranted to maintain their adjustment under all climatic conditions.

Multiple Weight Attachment—For the purpose of mechanically manipulating the weights by means of a keyboard located in front of the Balance Free from annoying complications and possibilities for making errors. The most perfect device for this purpose and a great time-saver. Capacity of weights for assay balances 221 or 121 milligrams. For Analytical Balances 2210 milligrams.

Mechanical Pan Extractor—For the purpose of conveying objects from the outside of the balance casing into the weighing pan of the balance, or vice versa, without opening the balance door. Prevents dust and air currents from penetrating into the interior of the balance and is a great time-saver.

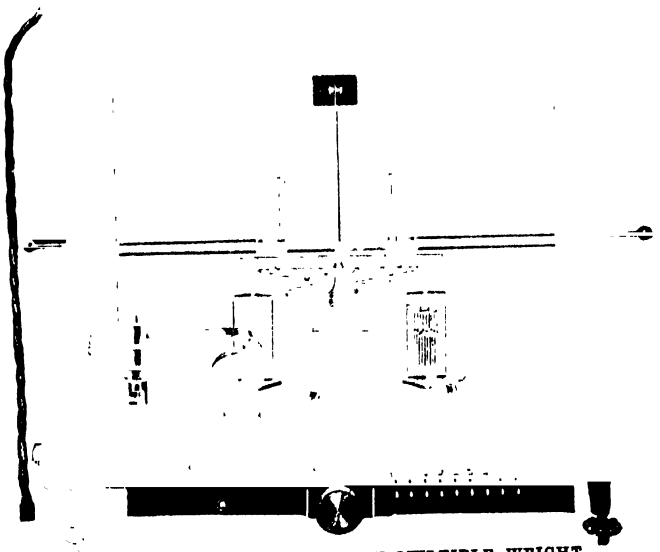
Electric Balance Illuminator—Enables the balance to be set up anywhere, even in a dark room, to perform the weighing at any time, day or night, and to obtain better results than with daylight.

Balance Cover—Is permanently attached to the balance casing. It is always there, always handy, never misplaced. Made of best quality artificial leather

Four groups of Assay Balances with sensitivities ranging from 1/100 *to* 1/500 *milligrams, or twenty different styles.*

Three groups of Analytical Balances with sensitivities ranging from 10 *to* 1/100 *milligrams, or fifteen different styles.*

Write for Complete Catalog.



HEUSSER ASSAY BALANCE, WITH MULTIPLE WEIGHT ATTACHMENT, PAN EXTRACTOR AND ILLUMINATOR

MONARCH MFG. WORKS, INC.

Westmoreland and Salmon Streets

PHILADELPHIA, PA.

PRODUCTS

Spray Nozzles, Airwashing Nozzles, Syphons, Lead Valves, Acid Lifts, Strainers.

ACID CHAMBER SPRAYS

Individually tested to give perfect, even atomization without streaks or drops

The nozzle (tip and disc) is made entirely of stoneware holder is made of lead. Acid proof and non-erosive, will not break or crack from temperature changes. Used by most sulphuric acid manufacturers. Fully guaranteed. Sent on sixty days' approval to any sulphuric acid plant in the U. S.

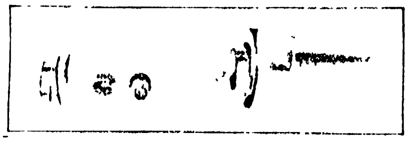


FIG 604 STONEWARE CHAMBER SPRAY

The illustration shows threaded type nozzle, which will fit existing lead socket using nozzles with soft lead inside parts

Flanged, Fig 602, Chamber Spray (not shown) except in installation opposite requires no wrench to tighten, and is often preferred to Fig. 604.

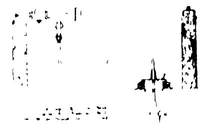


FIG. 602-604 INSTALLATION

CAPACITIES, GALLONS PER HOUR

Orifice M M	½	¾	1	1¼	1½	2	2½
Lbs pressure							
30		2 7	3	3 3	4	8 4	10 3
40	2 5	3 1	3 2	3 8	4 5	9	11 5
60	3 2	3 7	4 4	4 6	6 8	11	14
80	3 6	4	4 6	5 1	7	12	18
90	3 8	4 3	4 9	5 6	7 2	12 8	19

Larger capacities than above, up to about 200 g.d. at 60 lbs produced with Fig 602 and 602 A Stoneware nozzles No 2 size

ATOMIZING SPRAYS, BRASS

This type of spray nozzle screws directly onto pipe

They are made up regularly from Brass, Iron, Steel, Monel Metal, Hard Rubber, etc., in sizes ¼ to 1", capacities covering some of which are listed below.

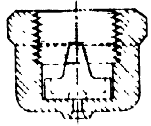


FIG. 610 NOZZLE

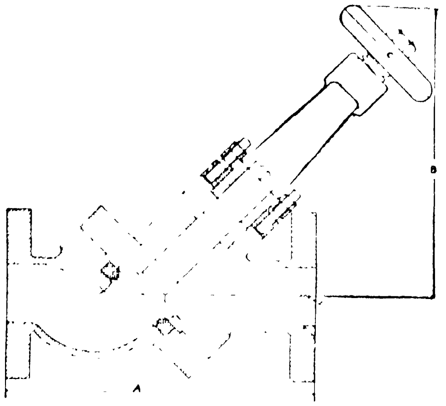
CAPACITIES, GALLONS PER HOUR

	¼" pipe							⅜" pipe			
Orifice M M	¼	½	¾	1	1¼	1½	2		2½	3	3¾
Lbs pressure								Lbs press			
30			2 7	3 0	3 3	5 1	7 3	5		23	36
40	1 0	2 5	3 1	3 2	3 8	5 7	7 9	10		31	42
60	1 3	3 2	3 7	4 1	4 6	8 6	9 6	15	22	38	56
80	1 8	3 6	4	4 6	5 1	8 8	10 5	20	25	43	60
								25	28	48	65
								30	33	51	72
								60	50	70	105

For ½", ¾" and 1" pipe sizes write for capacities which will be furnished

HARD LEAD STOP VALVE

The seat of this valve, when worn, may be rev and renewed from time to time. Spindle may b seated. Spindle does not turn on seat, therefore wear. Angle form of valve produced with same



DIMENSIONS

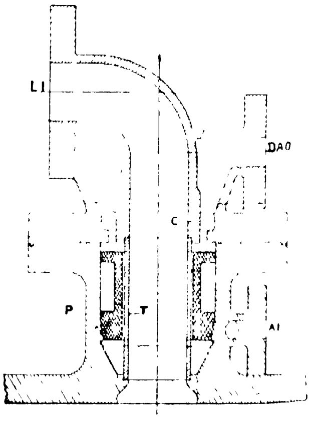
	1	1½	2	2½	3	4
A	7⅛	7⅜	10⅞	11⅞	12⅝	14
B	8	8½	10½	13	13½	15
C	3¾	3¼	4¼	6⅜		

AUTOMATIC ACID LIFT

This device can be quickly connected to any blowcase (egg), and will automatically blow acid to any desired height, depending on air pressure.

Operation—Acid flows from the usual low level tank through a check valve and through the "Monarch" Air Device into egg. When filling, the displaced air in egg escapes through passage between tube T and plug P into annular air chamber C and through discharge air outlet DAO. High pressure air enters at AI. When egg becomes filled acid flows up under plug P, and the combined action of air and liquid unseats plug, thus releasing high pressure air through several ports on taper seat, which forces plug P up and seating at top closes exhaust air port. Air then forces check valve shut and acid out the usual discharge pipe. Instantly egg and discharge pipe are cleared of acid there is a sudden rush of air out, dropping the pressure within the egg, thus allowing plug P to drop and close high pressure air ports and at the same time opening the exhaust port. The head of liquid in filling tank opens check and starts recharging.

Operation is continuous and automatic, and therefore saves air, men and money.



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These highly-successful balances have been used and recommended during the past fifteen years by Assayers, Chemists and Scientific Research Workers the world over. They have been recognized as instruments of superior qualities possessing many valuable, unique and distinguishing features which are briefly described below.

All Metal Balance Casing—Combining elegance of appearance with great mechanical strength; is absolutely proof against all climatic conditions, magnetic disturbances and electrical influences. It admits an unusually large amount of light and except through violent accidents it is practically indestructible.

Unit Base and Releasing Mechanism—Forms a compact unit of all the working parts. This construction maintains the perfect alignment and adjustments of all parts during transportation and in service.

Beams Are of the Trussed Form Combining maximum of rigidity with minimum of weight. All beams are direct reading and are warranted to maintain their adjustment under all climatic conditions.

Multiple Weight Attachment—For the purpose of mechanically manipulating the weights by means of a keyboard located in front of the Balance Free from annoying complications and possibilities for making errors. The most perfect device for this purpose and a great time-saver. Capacity of weights for assay balances 221 or 121 milligrams. For Analytical Balances 2210 milligrams.

Mechanical Pan Extractor—For the purpose of conveying objects from the outside of the balance casing into the weighing pan of the balance, or vice versa, without opening the balance door. Prevents dust and air currents from penetrating into the interior of the balance and is a great time-saver.

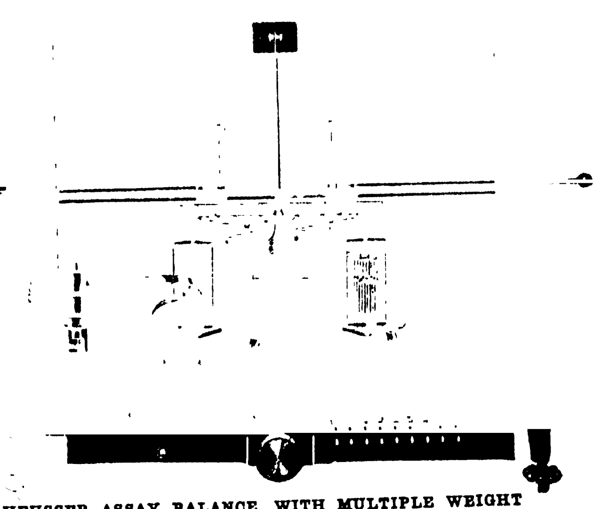
Electric Balance Illuminator—Enables the balance to be set up anywhere, even in a dark room, to perform the weighing at any time, day or night, and to obtain better results than with daylight.

Balance Cover—Is permanently attached to the balance casing. It is always there, always handy, never misplaced. Made of best quality artificial leather

Four groups of Assay Balances with sensitivities ranging from 1/100 *to* 1/500 *milligrams, or twenty different styles.*

Three groups of Analytical Balances with sensitivities ranging from 10 *to* 1/100 *milligrams, or fifteen different styles.*

Write for Complete Catalog.



HEUSSER ASSAY BALANCE, WITH MULTIPLE WEIGHT ATTACHMENT, PAN EXTRACTOR AND ILLUMINATOR

LUCAS E. MOORE STAVE CO., INC.

Hogsheads, Barrels, Casks and Kegs

NEW ORLEANS, LA.

EASTERN OFFICE
11 Broadway, NEW YORK, N. Y.

FACTORIES
NEW ORLEANS, LA. MOBILE, ALA. COLUMBUS, MISS. LEXINGTON, KY.

PRODUCTS

Wooden Containers for holding Liquid, Semi-Liquid, and Solid Chemical and Technical Products.

- **Barrels**
- **Casks**
- **Hogsheads**
- **Kegs**
- **Tubs**

MATERIALS

We use the best grade of White Oak, Red Oak, Gum and Ash woods exclusively, and carry large stocks of these woods at all times.

WORKMANSHIP

Containers for holding valuable liquids or semi-liquids require not only the highest grade of material, but above all, the greatest attention to perfection in workmanship Subjected as these containers are, to the roughest usage in shipment, they must be constructed in the strongest manner, and both the wooden parts and the metal hoops must be fitted with the greatest accuracy We have perfect facilities in our various factories for assuring this high grade of perfection

USES

Tight cooperage, such as we manufacture, is especially suited for use as containers for such substances as require, on account of their liquid nature, or their composition, to be enclosed in a package that will not only prevent leakage, but will, when necessary, prevent the deteriorating influence of exposure to air or moist atmospheres.

REPRESENTATIVE SUBSTANCES USUALLY SHIPPED IN TIGHT BARRELS

- Alcohols
- Beverages
- Bleaching compounds
- Chemicals
- Cider
- Dyes and colors
- Electro-plating solutions
- Extracts
- Fats
- Food products
- Glues
- Greases
- Paint, varnish and colors
- Polishes
- Sugars, sirups and molasses
- Vinegar

Of over 7,000 items of commercial chemical substances listed in the Condensed Chemical Dictionary, over 1,000 are best shipped in tight wooden barrels or kegs

KEGS, BARRELS AND HOGSHEADS

We can furnish large quantities of standard sizes of kegs, barrels and hogsheads, made of white oak, for containing liquids or semi-liquids of any nature

SHOOKS

We are prepared to furnish quantities of shooks for export.

STANDARD WHITE OAK BARREL

MOREHEAD MANUFACTURING COMPANY

Steam Drainage and Boiler Feeding Apparatus

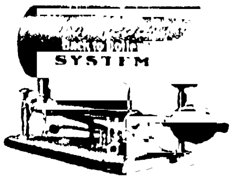
(Known as the Morehead Back-to-Boiler System)

DETROIT, MICHIGAN

PRODUCTS

Tilting Steam Traps, Return, Variable Pressure, Non-Return, Vacuum and Condenser Types, for Draining High or Low Pressure and Vacuum Heating System of Water of Condensation, and Making any Desired Disposition of the Condensation. There is a "Morehead" Steam Trap to Meet Every Condition Arising in a Steam Plant.

RETURN STEAM TRAP



"MOREHEAD" RETURN STEAM TRAP

The Return Steam Trap removes water of condensation from heating, drying and cooking apparatus and returns the condensation direct to the boilers regardless of any difference in pressure on the apparatus drained and the boiler or whether the apparatus is located above or below the water line. It is admirably adapted for use as a lift pump, and for feeding boilers from open or closed heaters. It handles perfectly, water at any temperature.

NON-RETURN TRAP

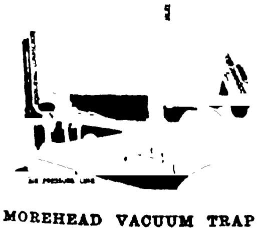
MOREHEAD NON-RETURN STEAM TRAP

This type of Morehead Steam Trap is especially adapted to the removal of condensation from high or low pressure steam mains, dryers, heaters, etc., and delivering the water to an open tank, hot well or feed water heater. This trap has a removable seat and disc in the valve. It discharges from low point, insuring an effective water seal at all times. It is guaranteed for 200 lbs. working pressure.

VARIABLE PRESSURE TRAP

Recommended for receiving and discharging to any desired point condensation from steam lines and apparatus working under varying pressures.

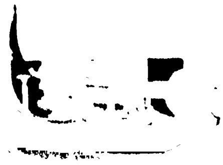
VACUUM TRAP



MOREHEAD VACUUM TRAP

The Vacuum Trap removes automatically all condensation from exhaust lines and oil separators operating under a vacuum without breaking or impairing that vacuum. It delivers the water of condensation to any desired point above or below the location of the trap and is guaranteed not to affect the vacuum in any way.

CONDENSER TRAP



MOREHEAD CONDENSER TRAP

The Condenser Trap is a combination of the features of a Morehead Automatic Return Trap and the Jet or Spray Condenser. It is especially adapted to service on exhaust steam and reduced pressure heating, cooking and drying apparatus. The **positive vacuum** formed in the tank of the trap removes rapidly all condensation in the system, accelerates the travel of the steam and reduces the back pressure on the engine.

SIZES, CAPACITY AND WEIGHTS MOREHEAD TILTING VARIABLE PRESSURE AND NON RETURN STEAM TRAPS

Variable Pressure Trap	Non Return Trap	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
31	21	1	1	200 gal	12000 ft	3000	1500	100
32	22	1¼	1¼	400 gal	25000 ft	5200	2100	175
33	23	1½	1½	600 gal	40000 ft	12000	5200	250
34	24	2	2	750 gal	60000 ft	21000	9000	275
35	25	2½	2½	900 gal	90000 ft	27000	16000	350
36	26	3	3	1300 gal	110000 ft	30000	30000	450

MOREHEAD TILTING RETURN, VACUUM, AND CONDENSER STEAM TRAPS

Vacuum Trap	Condenser Trap	Return Trap	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Weight
41	51	1	1	1	1050	5000	2500	1000	100
42	52	2	1¼	1	1850	9000	4000	1800	175
43	53	3	1½	1¼	4000	20000	9000	4000	250
44	54	4	2	1¼	6000	35000	10000	7000	275
45	55	5	2½	2	11000	50000	25000	12000	350
46	56	6	3	2	15000	75000	40000	18000	400

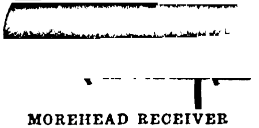
The above capacities are figured on a basis of 50 pounds pressure to the square inch The above drainage capacity in inch pipe is based on ordinary radiating conditions For lumber kilns, greenhouses and moist goods, divide by two For laundries, brick dryers and wet goods, divide by three For fan stacks and blowers, divide by five

Capacities of steam traps vary greatly, according to conditions under which they are operated

Note -3 feet of 1 inch pipe equals one square foot of surface 2.3 feet of 1¼ inch pipe equals one square foot of surface 1.61 feet of 2 inch pipe equals one square foot of surface.

MOREHEAD RECEIVERS

No	Length Inches	Height Inches	Diameter Inches
1	30	16	10
2	40	20	12



MOREHEAD RECEIVER

No 1 Receiver has capacity for Traps Nos 1 and 2 No. 2 Receiver has capacity for Traps Nos 3, 4, 5 and 6

To compute the equivalent in 1 inch pipe of any quantity of pipe of larger diameter, use the following table of equations:

Size of Pipe	1¼	1½	2	2½	3	3½	4	4½	5	6	7	8
Equivalent of 1 Lineal ft in 1"	1.26	1.44	1.81	2.19	2.66	3.04	3.42	3.80	4.23	5.03	5.80	6.55

Special Note—Quotations on copper or brass tanks with bronze, brass, nickel, steel or cast iron fittings will be made on request.

MORGAN CONSTRUCTION COMPANY

Gas Producer Department

WORCESTER, MASS.

Cable Address MOR

PRODUCT

Morgan Producer-Gas Machine.

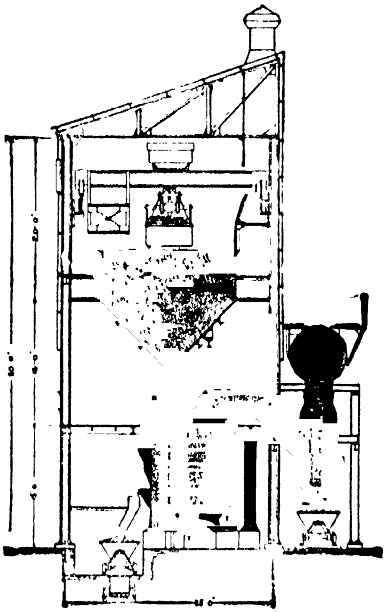
DESCRIPTION

The Morgan Producer-Gas Machine has established **a continuous record of satisfactory service** during the past seven years unapproached by any other type of mechanical Gas Producer. This service is attained by painstaking care in both design and manufacture and is based on the principle that continuous surface leveling of a gas-making fire gives results far superior to poking, both as to gas quality and ease of operation.

OPERATION

A measuring feeder delivers coal of any size up to four-inch cubes, direct from the overhead bin on to the fuel bed at frequent intervals, without action on the part of the operator, whose work is confined to regulating the speed to correspond with the demand for gas. The coal is properly spread and the surface continuously leveled by the leveler which floats on the fuel, and permits any practicable variation in height of surface.

Ash is removed mechanically at one point into a conveyor by a spiral-shaped plow, held stationary during one complete revolution of the ash-pan, and then released automatically.



INSTALLATION MORGAN GAS PRODUCER

The development of a closed feeder, operating without manual action, together with the other improvements noted, makes it possible for one man to attend to the gasification of nine tons of coal per hour.

OPERATING RESULTS, GAS QUALITY

In one plant of a leading steel company four units were installed to do the work usually requiring six mechanical producers. During a period of four months three machines produced all the gas, working at an average rate of over 30 tons coal per day. Continuous twelve-hour samples of the gas were taken day and night for several weeks with the following results:

AVERAGE ANALYSIS OF 12-HOUR CONTINUOUS GAS SAMPLES

Date	CO_2	C_2H_4	CO	H_2	CH_4	B. T. U. of Gas	
						U. S. Steel Formula	Total at 32° Fahr.
Feb 2-7, 1914	2.8	0.6	27.4	11.4	3.6	162.0	182.5
Feb 9-14, 1914	2.8	0.6	27.3	11.1	3.4	159.0	179.0

QUANTITY OF COAL GASIFIED IN CONTINUOUS OPERATI

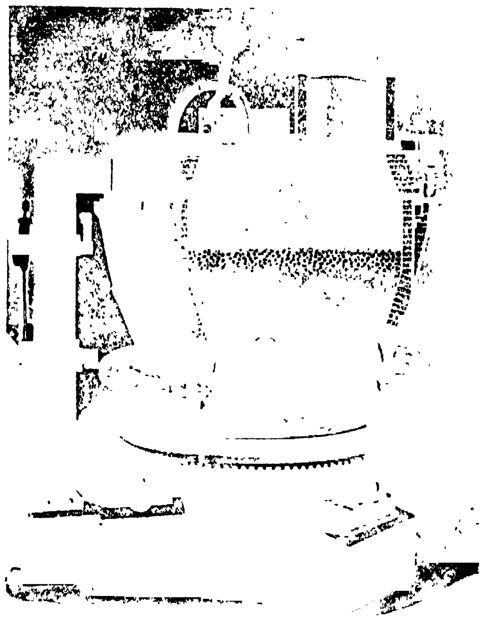
Date		Average Pounds Coal per Hour	Average B. T. U. per Cu. Ft. of Gas	
			U. S. Steel Formula	Total at 32° F.
Feb. 9, 1914	Day	2800	158.5	178.5
	Night	2740	149.0	168.0
Feb. 10, 1914	Day	2740	162.5	183.0
	Night	2690	154.0	173.5
Feb. 11, 1914	Day	2740	168.0	189.0
	Night	2690	151.5	170.5
Feb. 12, 1914	Day	2800	166.0	187.0
	Night	2860	148.0	166.5
Feb. 13, 1914	Day	2840	165.5	186.0
	Night	2800	160.0	180.0
Average		2760	158.5	178.0

Another customer, operating open-hearth furnaces, analyzed an eight-hour continuous sample of the gas practically every day. The average for five months was 3.5 per cent CO_2, 28.8 CO, and 182 B. T. U.

Further experimenting gave them the following gasifying capacities and disclosed the fact that the quality of gas does not suffer at these high working rates.

GASIFYING CAPACITY OF PRODUCER-GAS MACHINE

Date	Net Tons Coal per Day	Operating Hours per Day	Pounds Coal per Hour	B. T. U. of Gas	
				U. S. Steel Formula	Total at 32° F
September 21-22	32.35	23.70	2730	167.0	188.0
September 22-23	36.00	23.05	3120	168.5	190.0
September 23-24	34.15	22.05	3100	165.0	186.0
September 24-25	37.35	22.90	3260	165.5	186.5



SECTION OF PRODUCER GAS MACHINE

Feeder not shown

Catalog and List of over 400 Installations sent on request.

MORRIS MACHINE WORKS

ESTABLISHED 1864

BALDWINSVILLE, NEW YORK

ork N Y 39 41 Cortlandt St
rgh Pa Harris Pump & Supply Co
lex H A Paine
, S C Cameron & Barkley Co
as, Mo Merkle Machinery Co
Wash Vickers & Co
N Y Root Neal Co
Mich Power Plant Supply Co

Tampa, Fla Cameron & Barkley Co

Philadelphia Pa Real Estate Trust Building
Chicago Ill Henion & Hubbell 217 221 N Jefferson St
Charlotte N C Realty Building
San Francisco, Cal Harron Rickard & McCone
Boston Mass Starkweather & Broadhurst
Denver, Colo H W Moore & Co
Salt Lake City, Utah F C Richmond Machinery Co
Portland, Ore Gordon & Finkbeiner

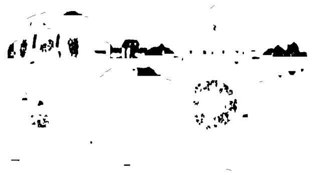
PRODUCTS

Centrifugal Pumping Machinery, Hydraulic Dredges, Stationary and Marine Engines.

EXPERIENCE

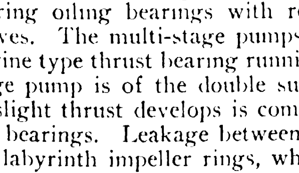
During the 57 years devoted to this line of work our experience has covered all services for which centrifugal pumps are used. We are the oldest and largest firm in the country building exclusively this type.

HORIZONTALLY SPLIT SINGLE AND MULTI-STAGE PUMPS



4-INCH HORIZONTALLY SPLIT SINGLE STAGE PUMP

This type of Pump meets the demand for an efficient pump capable of operating at high speeds for direct connection to electric motor or steam turbine. Where the head is high it is built in stages. The suction and discharge opening are cast in the bottom half so that the pump can be taken apart without disturbing the pipe lines. The enclosed impellers are of bronze, accurately finished and balanced for high speeds. The shaft is of steel, protected by bronze sleeves through the stuffing boxes. These pumps are equipped with outboard ring oiling bearings with removable babbitted sleeves. The multi-stage pumps have a water cooled marine type thrust bearing running in oil. The single stage pump is of the double suction type and whatever slight thrust develops is compensated by S. K. F. ball bearings. Leakage between stages is prevented by labyrinth impeller rings, which also maintain the efficiency of the pump.

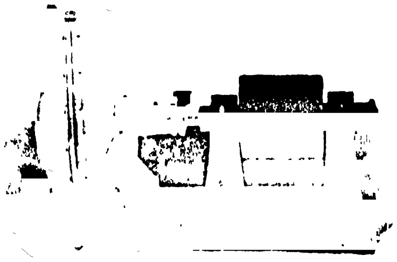


6-INCH 2-STAGE HORIZONTALLY SPLIT MULTI-STAGE PUMP

These pumps are made of an acid-resisting metal when operating in liquids containing sulphuric or other chemicals which would readily eat out the standard iron pump.

STANDARD HORIZONTAL PUMPS

This pump is the type most extensively used for general work, and is especially adapted for low lifts.

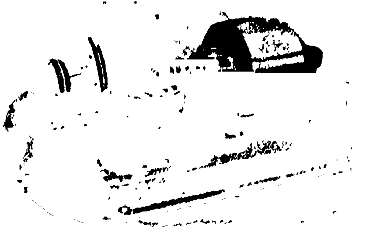


STANDARD HORIZONTAL PUMP

There is a substantial babbitted bearing on each side of the pulley, which can be furnished of the ring oiling type if desired. The shaft is of large diameter, made of turned steel. The stuffing box is deep and arranged with gland Sizes 1" to 12" inclusive are carried in stock.

SOLID LINED DREDGING PUMPS

This pump was originally designed for handling slimes in connection with gold recovery plants. The lining, which is practically an independent pump, is made either of Manganese Steel, Hard Cast Iron or Acid Resisting Bronze as desired. The impeller is of the enclosed type and of the same material as the liner. The bearings have removable babbitted sleeves. For handling gritty water, coal, ashes, sand gravel, etc., this pump is unexcelled. It is built in sizes from two to twelve inches, some of which are carried in stock.



SOLID LINED DREDGING PUMP

OVER 65,000 PUMPS IN SERVICE

MORSE CHAIN COMPANY

Largest Manufacturers of Silent Chains in the World

ITHACA, N. Y.

ADDRESS NEAREST BRANCH OFFICE

Atlanta, Ga 702 Candler Building
Baltimore, Md 1402 Lexington Building
Boston, Mass 141 Milk Street
Charlotte, N C 404 Commercial Bank Building
Chicago, Ill Merchants L & T Building
Cleveland Ohio Engineers' Building
Detroit, Mich 8th and Abbott Sts
Kansas City, Mo Morse Engineering Co Finance Building
Minneapolis, Minn Strong Scott Mfg Co, Third Street S
New York 50 Church Street
Philadelphia, Pa 808 Harrison Building
Pittsburgh Westinghouse Building
St Louis, Mo Morse Engineering Co, Chemical Building
San Francisco, Cal Monadnock Building
Canada Jones & Glassco, Registered
Montreal St Nicholas Building
Toronto Traders Bank Building

PRODUCT

Morse Silent Chains and Sprockets for the transmission of power for every purpose. The use of special alloy steels with heat treatment and improved machinery in the largest silent chain factory in the world, combine to make the most durable and only 99% efficient drive on the market.

GENERAL DESCRIPTION

The Morse Rocker Joint Silent Chain Drive is essentially a steel belt, made of flat links arranged to form teeth on one side of the chain which engage with teeth cut in the sprocket wheels over which it runs.

It is a gear belt and used in place of belting and gearing and made in varying pitches from ⅜ in. to 3 ins. to transmit from ¼ H. P. to 5,000 H. P.

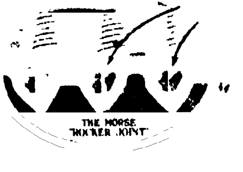
In use to-day for over 3,000,000 H. P., giving positive speed ratios, increased production, short centers, better light, less maintenance, freedom from overhead construction

25 H. P. MORSE SILENT CHAIN DRIVING POSITIVE BLOWER IN A WESTERN SMELTING PLANT

THE MORSE ROCKER JOINT

The principal difference between "Morse" and all others is in that unseen but all-important part, the joint. Morse Drives are constructed with the fact in view—the joint bears the burden. Instead of a single pin, as in other joints, two special pins, both held in their respective halves, form the joint. No bushing is required.

When the chain is running straight, between sprockets, the flat of seat pin bears against one of the flat faces of rocker pin. As the chain bends in circling each sprocket, the curved side of one pin rolls or rocks against the broad, flat side of the other, entirely eliminating destructive grinding friction.



THE MORSE ROCKER JOINT

SPEED AND SERVICE

This exclusive "Rocker Joint" construction enables the Morse to run at a speed far in excess of other chains because lubricant is not essential to its operation; and after years of service (in every line of industry) it is accepted as the most durable chain on the market.

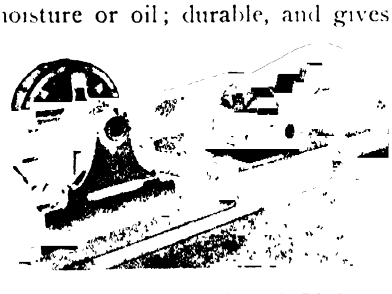
MATERIAL PARTS

"Morse Drives" have great mechanical strength and are made with a large factor of safety, assuring 100 per cent overloads. They need little attention, and consist of driving and driven sprockets (solid or split, s s, and keyed) and silent chain belt. Driven sprockets are usually of cast iron. Driving sprockets of cast iron or steel as service requires.

100 H. P. MORSE SILENT CHAINS DRIVING 5' x 20' TUBE MILLS
Six in sight, more on another floor

ADVANTAGES

Morse is accepted as the drive that is: positive as gears, flexible as a belt; unaffected by heat, cold, moisture or oil; durable, and gives long life and is especially desirable for service in Chemical and Metallurgical Works where dust, gases, acid fumes and steam ruin leather belting.



80 H. P. DRIVE SHEET LEAD ROLLS
Reverses drive every 45 seconds

The world-wide demand and use in the most severe duty of Chemical Works, Smelters, Mines, and Mills is the evidence of their success.

MORSE ENGINEERING SERVICE

Send us your general layout and let our Sales Engineers design the drive to suit your special requirements. Engineering service and designs free. Address nearest office. Free bulletins for every industry.

MORRIS MACHINE WORKS

ESTABLISHED 1864

BALDWINSVILLE, NEW YORK

York N Y 39 41 Cortlandt St
rgh Pa Harris Pump & Supply Co
Tex H A Paine
S C Cameron & Barkley Co
Mo Merkle Machinery Co
Wash Vickers & Co
N Y Root Neal Co
Mich Power Plant Supply Co
Tampa, Fla Cameron & Barkley Co
Philadelphia Pa Real Estate Trust Building
Chicago Ill Henion & Hubbell 217 221 N Jefferson St
Charlotte N C Realty Building
San Francisco, Cal Harron Rickard & McCone
Boston Mass Starkweather & Broadhurst
Denver, Colo H W Moore & Co
Salt Lake City, Utah F C Richmond Machinery Co
Portland, Ore Gordon & Finkbeiner

PRODUCTS

Centrifugal Pumping Machinery, Hydraulic Dredges, Stationary and Marine Engines.

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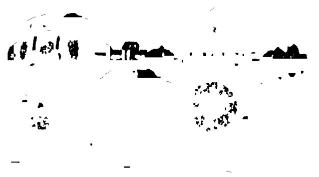
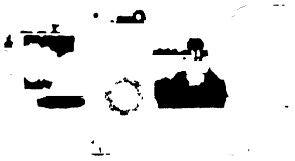
During the 57 years devoted to this line of work our experience has covered all services for which centrifugal pumps are used. We are the oldest and largest firm in the country building exclusively this type.

HORIZONTALLY SPLIT SINGLE AND MULTI-STAGE PUMPS



4-INCH HORIZONTALLY SPLIT SINGLE STAGE PUMP



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STANDARD HORIZONTAL PUMPS

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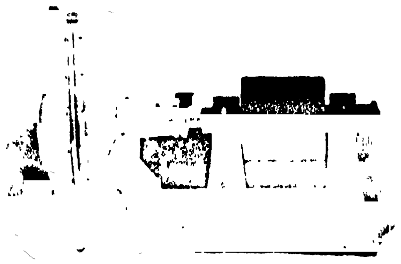

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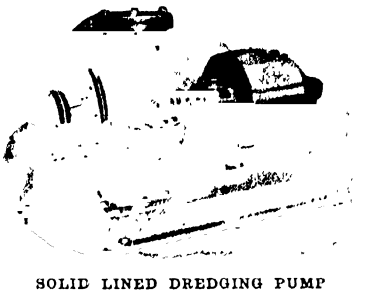
SOLID LINED DREDGING PUMPS



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OVER 65,000 PUMPS IN SERVICE

MULTI METAL COMPANY, Inc.

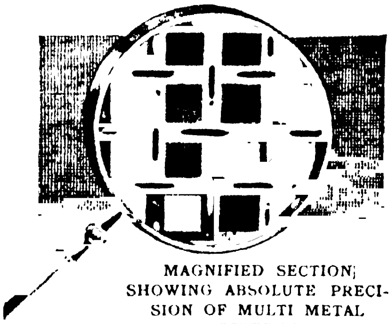
257 West 19th Street
NEW YORK, N. Y.

PRODUCTS:

Wire Cloth in all meshes and all metals, for Sifting, Bolting, Straining and Filtration. Metallic Filter Cloth, acid and alkali resistant; Standard Laboratory Testing Sieves up to 300 mesh; Special Sieves for Manufacturing Purposes; Swiss Silk Bolting Cloth; Perforated Metals.

WIRE CLOTH:

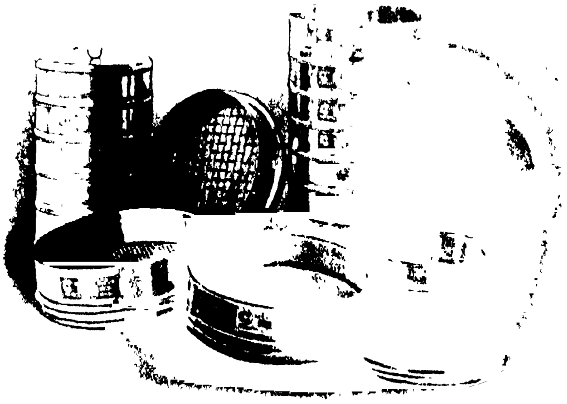
Wire Cloth of precision and great durability, especially adapted to the exacting requirements of the Chemical Industries. Made in all meshes from No. 1 mesh up to No. 300 mesh in all metals, such as Aluminum, Brass, Bronze, Copper, German Silver, Iron, Monel Metal, Nickel, Silver, Steel, also Lead and Tin-coated Steel Screens.



MAGNIFIED SECTION; SHOWING ABSOLUTE PRECISION OF MULTI METAL SCREENS

STANDARD TESTING SIEVES:

Sieves from No. 1 mesh to No. 300 mesh carried in stock in 6", 8" and 12" diameter. Made according to specifications of Bureau of Standards.



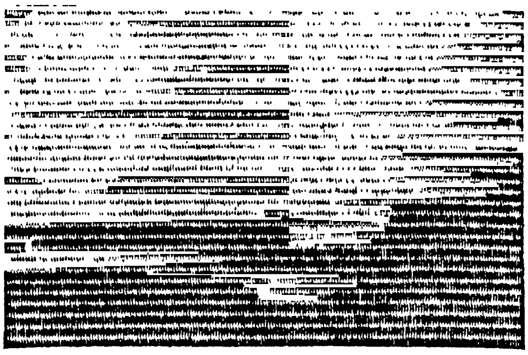
TESTING SIEVES

SIEVES FOR MANUFACTURING PURPOSES:

For sifting small batches of chemicals, colors, dyes, etc., which would not warrant the installation of sifting machinery, we supply special manufacturing sieves, made in any size or shape and in a variety of metals and meshes.

MONEL METAL FILTER CLOTH:

An all-metal filter cloth, acid and alkali resista filtration of chemical solutions, sugar juices, etc ried in stock at all times. Filter Leaves of an promptly covered.



MONEL METAL FILTER CLOTH No. 300

FABRICATING DEPARTMENT:

In this department we fabricate our wire cloth into Sieves of every kind, Strainers, Dipping Baskets, etc. We also cover Filter Leaves of every type. Quick service and unsurpassed workmanship.

FILTER LEAVES

SPECIAL SERVICE DEPARTMENT:

When confronted by problems involving the sifting, bolting or filtering of materials, we suggest that you avail yourself of our services as screening specialists. This service is free.

SILK BOLTING CLOTH:

Swiss Silk Bolting Cloth and Grit Gauze, from 18 mesh to 200 mesh, carried in stock in 40" width. Cloths made up to fit any bolting machine.

PERFORATED METALS:

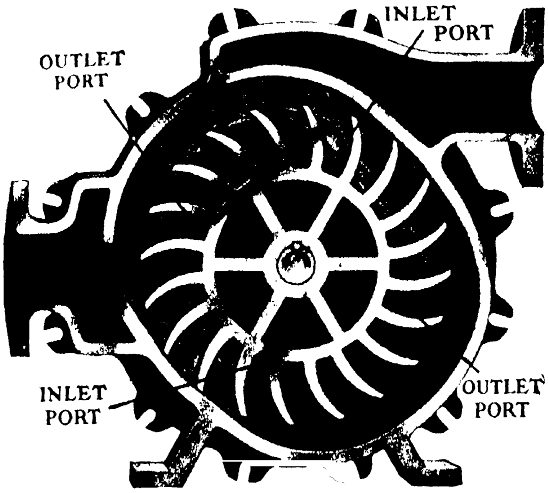
We specialize in perforated screens of the unusual kind, such as Aluminum, Monel Metal, Nickel; also Brass, Copper, etc.

THE NASH ENGINEERING COMPANY

SOUTH NORWALK, CONN., U. S. A.

PRODUCTS

Vacuum Pumps; Acid Pumps (Gas); Compressors; Vacuum Heating Pumps; Boiler Feed Pumps; Centrifugal Pumps.



NASH HYTOR

NASH HYTOR

The pumps here described have been built for over eight years by the Nash Engineering Company and have been sold extensively under the name Hydroturbine. The new name Hytor has now been adopted.

Principle of operation is shown in the sectional drawing.

A rotor in hydraulic balance revolves freely with large clearances, in an elliptical casing filled with water. The water, turning with the rotor, and constrained to follow the casing by centrifugal force, alternating recedes from and is forced back into the rotor, twice in a revolution. As the water recedes from the rotor it draws in air through the inlet ports. When the water is forced back into the rotor by the converging casing, the air is first compressed and then discharged through the outlet ports.

To absorb the heat of compression a small continuous supply of water is introduced at the pump inlet. This water, with any additional liquid drawn in with the air, is discharged through the outlet ports with the air.

The quantity of water required for operation is usually 1½ to 2 gals. per 100 cu. ft. of air, depending on the water temperature and the pressure and dryness of the air required.

While water ordinarily is used as the displacing liquid, because of the fact that it is usually available and because of the higher efficiency due to its low viscosity and relatively great weight, any other liquid may be employed provided it does not form scale or attack the interior of the pump and provided it is not too viscous.

DRY AIR

The air is freed entirely of entrained moisture by a special separator supplied with each compressor. This separator is equipped with a ball float valve, which automatically allows the water to escape without loss of air.

The air is delivered saturated at approximately the temperature of the water issuing from the separator.

The Hytor compressor and vacuum pump is valveless, has no gears, loose moving or reciprocating parts, no piston packing to renew, no cylinders to lubricate and no bearing adjustments to make.

CLEAN AIR

The air is thoroughly washed during compression and contains no oil. In many instances the Nash Hytor compressor can be used to do the work of an air washer, an air cooler, and a compressor.

This washing feature is a great advantage in the agitation of food products or in agitation or absorption processes where the diffusion of air or gas is accomplished by blowing through filtros plates, porous blankets or small orifices.

ACID GAS

Nash Hytor compressors are successfully handling various gases, both acid and alkaline, either with special arrangement for various liquid seals or in special constructions.

MATERIALS

Standard Hytor compressors are constructed of cast iron, but special machines are supplied with bronze lining, and of solid bronze.

PRESSURES

The Nash Hytor is recommended for pressures up to and including 15 lbs. per sq. in. and for vacuums not in excess of 20″ of mercury.

Capacities Standard Pressure			Capacities Standard Vacuum Pumps		
Size	Speed	Cu. ft. free air per min. against 10 lbs. pressure	Size	Speed	Cu. ft. per min. at vac. 12″ mercury
½ 0	1600	30	½ 0	1350	25
0	1600	50	0	1350	40
1	1300	90	1	950	90
2	750	200	2	650	180
3	600	340	3	500	300
4	500	450	4	445	440
6	360	935	6	310	900
7	300	1400	7	260	1350
8	230	2250	8	200	2150

Patterns for larger sizes carried in stock.

PUBLICATIONS

Bulletin Number	Subject
15	Jennings Hytor Vacuum Heating Pumps
16	Hytor Air Line Heating Pumps
10	Nash Hytor Compressors
11	Nash Hytor Vacuum Pumps
17	Jennings Hytor Condensation Return Pumps
18	Jennings Hytor Turbine Driven Heating Pumps
19	Jennings Hytor Suction Centrifugal Pumps

NASSAU VALVE & PUMP CORPORATION

Manufacturer of "Chemetal" Acid Resisting Valves, Pumps, Etc.

ROCKVILLE CENTRE, N. Y.

PRODUCTS

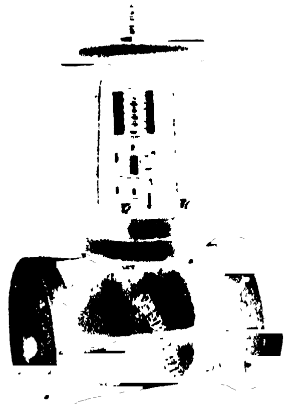
"Chemetal" Valves, Pumps, Strainers, and Castings for corrosive liquids. Special valves made to order.

"CHEMETAL" VALVES

Especially designed for acid service in the Chemical and Allied Industries, **"Chemetal"** Valves are made of a high grade antimonial lead for a standard pressure of 150 lbs. and can be supplied in all standard sizes in the following patterns. Globe, Angle, Gate, Cross, "Y," Check, and Diaphragm. The stem, which is of the rising type, is made of bronze and covered with **"Chemetal,"** so that all parts of the valve coming in contact with the liquid are protected by this acid-proof alloy.

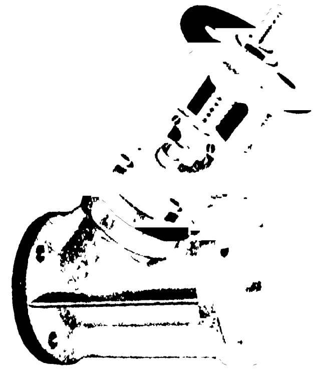
Valve bodies are heavily reinforced by ribs to prevent breakage or warping of flanges. Special va may be ordered made of Aluminum, Brass or specified alloy. Valves may also be supplied acid proof rubber discs or rubber plugs, for handling of liquids that are carrying a large am of gritty material in suspension.

VERTICAL CHECK VALVE



"CHEMETAL" GLOBE VALVE

"CHEMETAL" GATE VALVE



"CHEMETAL" "Y" VALVE

DIMENSIONS "CHEMETAL" VALVES

Size of Valve	1"	1½"	2"	2½"	3"	4"	6"
Face to Face (Globe, Diaphragm, Gate, and Horizontal Check)	5½	6	7	7½	8	9	10½
"Y" Valve—Face to Face	7	7½	8½	9	9½	10½	15
Center to Face (Angle Stop and Angle Check)	2¾	3¼	3⅞	4⅜	4¾	5⅛	7¾
Diameter of Flange	4	5	6	7	7½	9	11
Diameter of Bolt Circle	3	3⅞	4¾	5½	6	7½	9½

Vertical Check Valve	¾"	1"	1½"	2"	2½"	3"
Face to Face	1⅞	2	2⅛	2⅛	2¼	2½
Diameter of Flange	4	5	6	6¼	7½	8
Diameter of Bolt Circle	3	3⅞	4¾	5⅛	6	6½

"CHEMETAL" PUMPS

"Chemetal" Centrifugal Pumps are suitable for pumping a wide variety of acids and chemical solutions, and are used extensively in chemical plants.

The casing is built of a special lead alloy reinforced by heavy ribs. Pumps have large center suction and discharge opening may be turned in any direction to suit pipe connections.

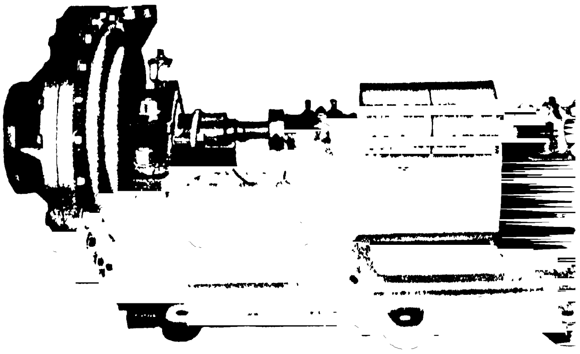
The impeller is of the enclosed type, made of "Chemetal" with bronze core; all surfaces hand finished to reduce friction losses; impeller and shaft carefully balanced to insure smooth running. Impeller and casing fitted with suitable labyrinth rings to prevent leakage of liquid from discharge to suction.

Stuffing boxes are made extra long and can be furnished with waterseal and drip gland.

Shaft of high grade steel and large diameter; one end screwed into the bronze core and protected by heavy **"Chemetal"** sleeve; the other end held rigidly by two outside bearings of the ring oiling type with thrust collar and wiper.

Bed plate and stands of cast iron, and fitted for belt drive or direct connection to motor or turbine. Flexible couplings furnished for all motor driven pumps; suitable tight and loose pulleys for belt drive.

Data Required for Estimates—1. What is the liquid to be pumped? Give temperature and specific gravity. 2. Capacity of pump in gallons per minute. 3 Total lift, including suction, discharge, pipe frictio in feet. 4. Motive power, whether belt drive or di rect connected motor. 5. Pump discharge to be righ or left hand.



"CHEMETAL" PUMP, BELT DRIVEN

Number of Pump	1"	1½"	2"	3"	4"
Suction	1½	2	3	4	5
Discharge	1	1½	2	3	4
Normal Capacity G. P. M.	25	70	100	250	45

"CHEMETAL" CASTINGS

"Chemetal" castings of any description are ma to order and properly machined and finished in accor ance with customers' drawings and specifications.

NATIONAL AIROIL BURNER COMPANY

Ninth and Thompson Streets

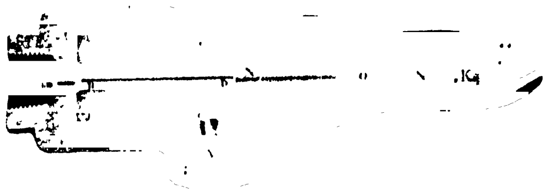
PHILADELPHIA, PA.

PRODUCTS

Oil Burners and Oil Burning Equipment.

GENERAL DESCRIPTION

The National Oil Burner is of the internal steam atomizing type—an inside mixer—but differs in every feature of its construction for any other burner of its class. It is a result of scientific study of the principles of combustion and steam engineering The oil is so thoroughly prepared inside the burner that every atom of the heaviest fuel oil is consumed without ever clogging the burner or forming any accumulation of carbon inside the furnace



INTERIOR DETAILS OF NATIONAL OIL BURNER

Oil under low pressure enters the burner at (A) and passes into a chamber (C), which entirely surrounds the steam nozzle (BD) After the first few minutes of operation the entire burner is at steam temperature, about 250° F or higher, and the oil while in the chamber (C) is raised to about that temperature

The steam nozzle (BD) extends into and discharges the steam into a forward nozzle (NON). The oil passes from chamber (C) in an annular film into the same nozzle (NON). This nozzle (NON) forms a venturi tube with its throat at (O) The relation of the two nozzles (BD) and (NON) is so calculated that the angle of expansion of the steam leaving nozzle (BD) causes the steam to cut its way through and mix with the oil at (O) The oil and steam so mixed then pass to the front chamber (K) where they are churned into an emulsion, while the fan-shaped orifice through which the oil is fed from the chamber (K) into the furnace, is designed to sufficiently retard the discharge of the mixture of oil and steam during the churning process.

SPECIAL FEATURES

The National Oil Burner has several special features worthy of notice:

There is no needle valve in the burner The importance of this feature cannot be overestimated Despite the most careful straining, particles of solid matter and small globules of water will occasionally pass into the system and clog a burner having a needle valve In the National Oil Burner this globule of water passes into chamber (C) and then into chamber (K) where it is churned up with the oil and steam and its presence has no effect.

Because of the superheating of the oil in chambers (C) and (K) as it is fed into the furnace, it is only necessary to have the oil in the system hot enough to flow freely, about 100° to 120° F

The National Oil Burner is constructed on the principle of an injector, and when the steam is turned on will feed the oil into the furnace when there is only sufficient pressure on the oil to cause it to flow freely to the burner

Chamber (K) is so constructed that pressure builds up at the discharge nozzle of the burner and makes possible a great economy in the consumption of steam for atomizing the oil, not more than one and a half to two per cent of the steam generated being used for this purpose

We absolutely guarantee that the National Oil Burner will operate continuously without clogging and without the need of cleaning, and that it will consume every atom of the heaviest fuel oil without leaving any unconsumed carbon

OPERATION

This burner is exceedingly simple in operation and can be handled without danger by the average attendant about the plant, and in the boiler room, complete instructions for operating are furnished with each burner.

APPLICATIONS

These burners can be used for many industrial heating purposes, principal among which are:

Firing kilns in the ceramic, brick, tile and refractory industries

Firing furnaces used in the glass industry

Firing kilns for manufacture of chemicals, cements, pigments, etc

Operation of various types of reverberatory and other furnaces in the metallurgical industries

Heating stills, boilers, digesters and all kinds of direct-fired equipment in the various chemical industries

In addition to the above, these burners are capable of unlimited application in the power generating departments of all kinds of industrial chemical plants.

CAPACITIES

National Oil Burners are made in three regular sizes

No 1—Small size, sufficient for 100 h. p. boilers or small heating or melting furnaces

No 2—Medium size, sufficient for 175 h. p. boilers or medium heating or melting furnaces

No 3—Large size, sufficient for 275 h p. boilers or fairly large heating or melting furnaces

All three sizes will do considerably more than stated, but experience tells us that it is economical to operate the burners moderately rather than to force any burner to its limit However, three No. 3 burners will easily care for 1000 h. p. boilers or large heating or melting furnaces.

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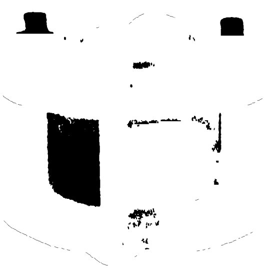

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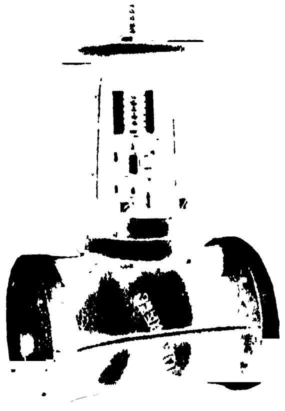

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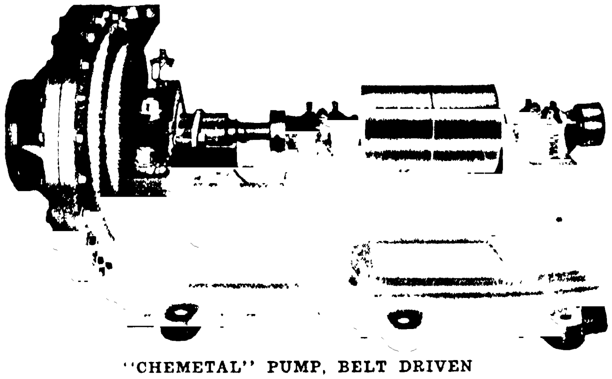

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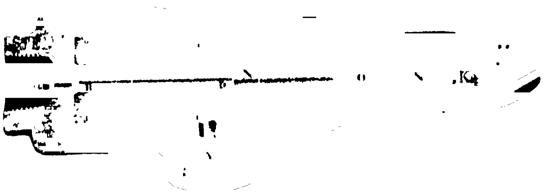

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NATIONAL FILTER CLOTH & WEAVING CO.

Manufacturers of Filter Cloth Exclusively

56 HOPE STREET, BROOKLYN, N. Y.

CHICAGO OFFICE 538 So. Dearborn Street

PRODUCTS

Cotton Filter Cloth in a great variety of weaves for filtering any required liquid.

FACILITIES

In our manufacturing plant located at the above address, we have weaving machines for the production of filter cloth with any mesh you may desire. The filtration problems that daily come to the attention of the process engineer can best be solved by the selection of the proper mesh of cloth. Filter Cloth carried in stock in standard weaves may be satisfactory in many instances, but our business was founded on the knowledge that special weaves are essential to the rapid and thorough clarification of innumerable products. We are specialists in filter cloth and can solve your individual problem as we have a host of others.

If you are having trouble filtering your products, write us now, or better yet, send us a sample of the material and our **Special Service** Department will undoubtedly find that your difficulty has already been overcome by us, in some other similar case.

ONE OF OUR WEAVING MACHINES

CONSULTATION

We have solved some very unusual problems during the recent years of growth of the chemical industries. The time for filtration has been cut to a fraction of that formerly required for the many new products that were developed. The accumulated data we have at hand from all these problems will aid us in advising you, while we reserve only the confidential matters.

STANDARD MESH FILTER CLOTHS

Some of our weaves are of standard requirements and we are ready at all times to submit samples and quote prices to firms interested in securing filter cloth direct from the manufacturer.

SPECIAL FILTER CLOTHS TO ORDER

We manufacture Filter Cloth in width from 26 inches to 72 inches, clusive.

Weight of goods varies from 12 ounces per square yard to 30 ounces per square yard.

Cloth can be made up to be shipped by the roll, or cut into sheets to fit any type of standard or special press or filter.

A FEW OF THE PRODUCTS FILTERED THROUGH OUR CLOTHS

Aniline Dyes
Lakes
Mineral Colors and Pigments
Clay
Whiting
Varnish
Cottonseed Oil
Animal Oils
Fish Oils
Olive Oil
Fruit Juices
Wine
Sugar Liquors
Pharmaceuticals
Explosives
Insecticides
Paraffine Wax
Petroleum By-products

THE RELATION OF PROPER CLOTH TO EFFICIENCY

A slight change in the weave of filter cloth used will often make great changes in the cost of producing a commercial product.

For instance, in the manufacture of dyestuffs special weaves are required for the proper filtration of certain dyes. If the proper weave is not attained there is a consequent loss in the output of the batches. We would suggest, on all present low yields of dyes per batch, that you get in touch with us and make a few runs with various weaves that we make, to ascertain the effect on the yield of your product.

DELIVERIES

Our manufacturing facilities are such as to enable us to guarantee Uniform Deliveries.

After solving problems for our customers, by finding the weave that gives the most efficient results, we are certain that the problem is solved once for all. By that we mean that our cloth is uniform for every shipment, whether these shipments are one day or six months apart.

PRICES

We shall be pleased to quote promptly on any quantity of any of our standard or special weaves.

THE NATIONAL PIPE BENDING COMPANY

Incorporated 1883

Coilers of Pipe and Tubing

164 River Street

NEW HAVEN, CONN.

BRANCH OFFICES

Boston, Mass
Buffalo, N Y.
Chicago, Ill
Cleveland Ohio
Jacksonville, Fla
Charlotte, N C
Philadelphia Pa
Pittsburgh Pa
Salt Lake City, Utah
Washington, D C
New York, N Y

PRODUCTS

Coils and Bends of Iron, Brass and Copper Pipe and Tubing, Refrigerating Coils, etc.

Coil Type Feed Water Heaters, Fuel Oil Heaters, Water Storage Heaters; Instantaneous Hot Water Generators and Forced Circulation Heating System Convertors; Direct Contact Open Type Heaters and Purifiers; Storage Heaters; Steam and Oil Separators, Steam and Feed Water Heaters.

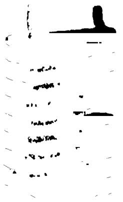
FACILITIES

All "National" Coils are continuous, without couplings or screwed fittings, unless specified. Iron and Steel Coils have electrically welded joints and all Brass and Copper Tubes have brazed joints. The National Pipe Bending Co. is equipped to fill practically any want in the line of pipe and tube bending. Prepared to submit designs, specifications and estimates covering coils and bends for the particular requirements of plant. The National Pipe Bending Co. is constantly making large numbers of new designs and will quote promptly on receipt of sketches and specifications Among the types of coil regularly manufactured are

1 Square or box coils
2 Oblong or trombone coils
3 Zigzag coils
    (a) Plain zigzag coils
    (b) Collapsed zigzag coils
4 Flat spiral coils
    (a) Plain flat spiral coils, Fig 218
    (b) Dished flat spiral coils
    (c) Multiple deck flat spiral coils, Fig 216
5 Spiral coils:
    (a) Plain helical coils
    (b) Tapered helical coils
    (c) Double nested helical coils, also triple nested, quadruplicate nested, etc Fig 60 shows triple nested helical coils

SPIRAL COIL

This coil is made with both ends at the top, but the end which is brought up from the bottom may be turned up either inside or outside of the coil.



SPIRAL COIL

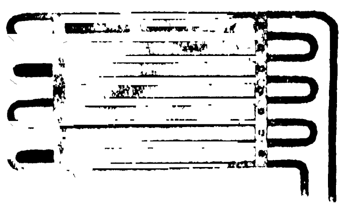
REDUCING COIL

This is a condenser coil for distilling plants. It is made by commencing with a large size of pipe and forming smaller pieces end to end successively until the last piece is what is required to carry the liquid.

REDUCING COIL

RETURN BEND OR ZIGZAG COIL

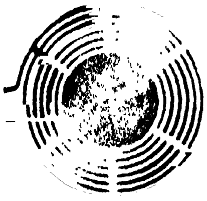
Used largely in refrigerating plants, also for heating coils, either by use of steam or hot water.



RETURN BEND OR ZIGZAG COIL

ROUND FLAT COIL, OPEN

This is made to go in the bottom of a round tank for heating or cooling purposes. Flat coils may be made to suit the shape of either square or oblong tank. It can also be dished if the tank has curved or conical bottom. We also make them carrying up the outside either plain spiral or taper, forming a "Basket Coil," which occupies little room in the tank but gives large heating or cooling surface. The ends may be carried in any direction.

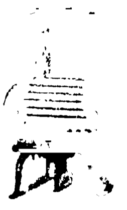


ROUND FLAT COIL

Round Flat Coil also made in "close" type.

NATIONAL FEED WATER HEATERS

Of Coil type, maintain efficiency under high overloading. The National design secures increased efficiency in heat transmission, insures even distribution of the feed water in the several coils or tubes and permits of easy access to the tube ends.



FEED WATER HEATER

NATIONAL STORAGE HEATERS

Heat and store large volumes of water for constant or occasional use. Either live or exhaust steam may be used Readily removable heating element facilitates inspection, repairs or the substitution of larger or smaller elements.

STORAGE HEATER

NATIONAL TANK & PIPE COMPANY

Manufacturers of Wood Products

PORTLAND, OREGON

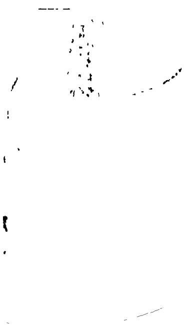
PRODUCTS

Tanks, including Mining Tanks, Paper Mill Tanks, Acid Tanks, Pulp Tanks, Conical Bottom Tanks, Thickener Tanks, Agitating Tanks, Zinc Boxes, Flotation Tanks, Acid Towers, Car Tanks, Water Tanks, Oil Tanks, Railroad Tanks, Rectangular Tanks, Pressure Tanks, Silos.

Reduction Plants, Filtration Plants, Cross Arms.

WOODEN TANKS

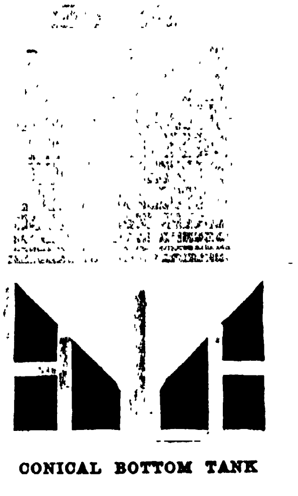
Douglas Fir or California Redwood, thoroughly seasoned. Diameters 1' to 100'; height 1' to 50'; thickness of material up to 6". Hooping standard round rolled thread mill steel bands. Special hooping either flat or round steel, bronze, etc. Furnished with plain or patent non-shrinking device as desired.



STANDARD ROUND WOOD TANK

CONICAL BOTTOM TANKS

Conical Bottom Tanks made with any degree bottom desired.



CONICAL BOTTOM TANK

PRESSURE TANKS

Equipped with steel or wood buck stays.

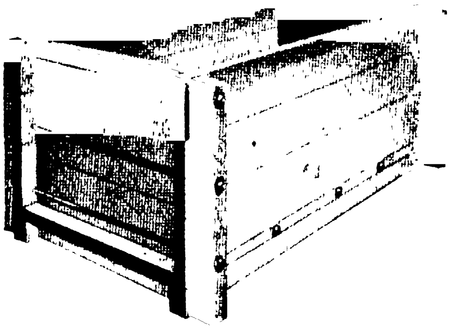
OIL TANKS

Plain or patent.

RECTANGULAR TANKS

Manufactured on special orders. Steel, bronze, lead covered rods. Built especially to meet the needs of

Chemical Works
Plating Works
Tanneries
Glue Works
Packing Houses, etc.



STANDARD RECTANGULAR TANK

DELIVERY

Large and varied stock on hand assures prompt delivery of any size order.

SHIPPING FACILITIES

Five Transcontinental Railroads. Water transportation to any port.

MANUFACTURING FACILITIES

Our factory, covering 12 acres at Portland, Ore., is one of the largest factories in the United States specializing in Tanks, Silos and Cross Arms. Our Engineering Department is competent to thoroughly solve any tank problems submitted.

CROSS ARMS

Manufactured to standard or special specifications from kiln dried Douglas Fir. Treated or untreated.

MILL DEPARTMENT

Specializing in kiln dried finish, flooring, pump rods, ceiling, special timbers, etc. Dimension or finish run to special patterns.

NEWARK WIRE CLOTH COMPANY

Wire Cloth in all Metals, Filter Cloth, Etc.
224 Verona Avenue
NEWARK, N. J.

PRODUCTS

- **Wire Cloth, All Grades, Fine and Extra Fine**
- **Filter Cloths (Metallic)**
- **Centrifugal Cloths**
- **Bolting Cloths**
- **Testing Sieves, U. S. Standard**
- **Chemists' Sieves**
- **Cement Sieves**
- **Foundry Riddles**
- **Coal and Sand Screens**

NEWARK (Trade Mark)

We make the above products in Brass, Copper, Bronze, Phosphor Bronze, Nickel, Steel, Monel Metal, Silver, Gold and Platinum, and in all meshes and sizes.

"NEWARK" METALLIC FILTER CLOTH

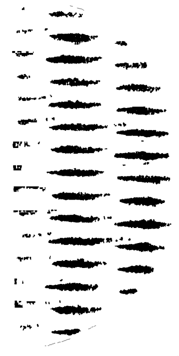
We are the originators of this grade of Metallic Filter Cloth; we invite close inspection of our three different grades of this material for filtration work and centrifugal linings.

Note the character and even texture of the weave, strength and durability, are imparted to the fabric. It has a double surface, is extra strong, and is readily cleaned.

One section shows the exact size of mesh, while the other section shows the cloth magnified—Note the spiral overlap in the weave. "Newark" Metallic Filter Cloth is for use in all makes of filter presses in place of cotton, duck, wool, jute or other filtering mediums —and will stand strong solutions which shorten life of others.

WRITE FOR SAMPLES

EXACT SIZE OF MESH



SAME MESH MAGNIFIED

SERVICE

We suggest that you try the Newark Wire Cloth Company's products and service.

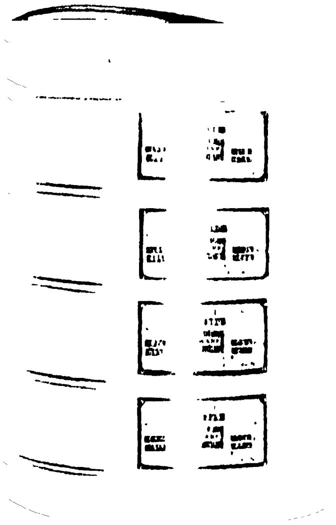
SAMPLES

We will gladly furnish samples of our Newark Filter Cloth, or other grades as may be required on request.

NEW U. S. BUREAU OF STANDARDS TESTING SIEVE SCREEN SCALE

This Screen Scale is a departure from any reference to mesh, and is designated by arbitrary numbers. It is essentially metric. A sieve having an opening of 1 mm. is the Basic one, the sieves above or below are related to it by the use of the fourth root of two as the ratio of the width of one opening to the next smaller opening.

This scale has been approved by all scientific bodies.



NEST OF U. S. STANDARD TESTING SIEVES

U. S. STANDARD SIEVE SERIES

Sieve Number	OPENING		Wire Diameter	
	MM	Inches	MM	Inches
2½	8.00	315	1.85	073
3	6.72	265	1.65	065
3½	5.66	223	1.45	.057
4	4.76	187	1.27	050
5	4.00	157	1.12	044
6	3.36	132	1.02	040
7	2.83	111	92	036
8	2.38	094	84	033
10	2.00	079	76	030
12	1.68	066	69	027
14	1.41	0557	61	024
16	1.19	0468	54	021
18	1.00	0.394	48	0187
20	84	0331	42	0165
25	71	0278	37	0146
30	59	0234	33	0129
35	50	0197	29	0113
40	42	0166	25	0098
45	35	0139	22	0085
50	30	0117	188	0074
60	25	0098	162	0064
70	21	0083	140	0055
80	177	0070	119	0047
100	.149	0059	102	0040
120	.125	0049	.086	0034
140	105	0041	074	0029
170	088	0035	063	0025
200	074	0029	053	0021
230	062	0025	046	0018
270	053	0021	041	0016
325	.044	0017	036	0014

R. S. NEWBOLD & SON CO.

"Eagle Works"

Established 1852

Founders, Machinists, Boilermakers

NORRISTOWN, PA.

PRODUCTS

Rolling Mill Machinery, Shears, Punches, Bending Rolls, Plate Straighteners, Pipe Cutters, Flanging Machines, Etc.

Iron Castings, for Chemical industries up to 30 tons.

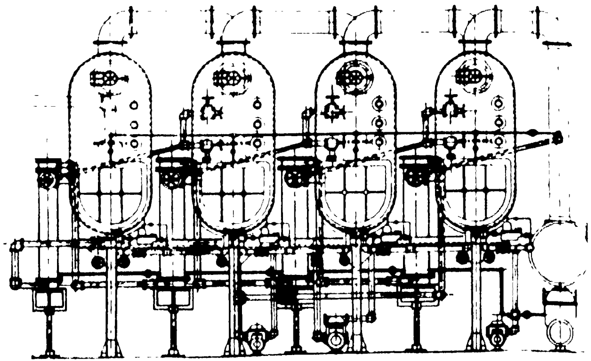
Steel Plate Work of every description, tanks, stacks, breechings, boilers, digesters, condensers, evaporators, vulcanizers, etc.

Machine Work and Pattern Work.

FACILITIES

Our shops are in Norristown, on the main line of the Philadelphia & Reading R.R., 17 miles from Philadelphia. We have our own Foundry, Machine Shop, Boiler Shop and Pattern Shop and can therefore do every part of a job requiring a combination of steel plate work, castings and machine work. This enables us to be responsible for every part of the work and also makes possible a quicker delivery than we could make if we were dependent on outside sources of supply.

We are equipped to manufacture all kinds of chemical machinery and tanks both of cast iron and steel plate and guarantee the highest standard of workmanship and material.



"NEWHALL" QUADRUPLE EFFECT EVAPORATOR FOR BLACK LIQUOR

SPECIAL MACHINERY

We specialize in apparatus for industrial and manufacturing processes built to customers' drawings. The services of our Engineering Department in the development of such apparatus is cheerfully offered.

EVAPORATORS

We are builders and designers of the "Newhall" Evaporator which has been used for over 30 years in cane and beet sugar refineries, pulp mills, textile mills and other chemical processes. It is built in horizontal or vertical form as best suits the industry where applied. With the addition of recently patented features we believe this evaporator to be the smoothest running, most economical and most efficient machine built and respectfully solicit your inquiries on any evaporating equipment you may wish to install.

PART OF 850 TON CONTRACT FOR PONTOONS AND DREDGE PIPE

EVAPORATORS UNDER CONSTRUCTION

VIEW OF PART OF BOILER SHOP

NEW ENGLAND TANK & TOWER COMPANY

Manufacturers of Wood Tanks and Related Appliances for the Chemical Industries

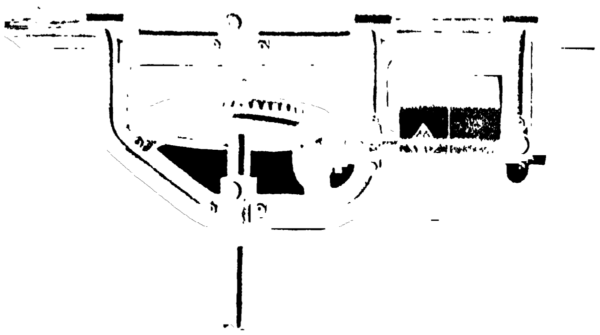
EVERETT, MASSACHUSETTS
(BOSTON POSTAL DISTRICT)

PRODUCTS:

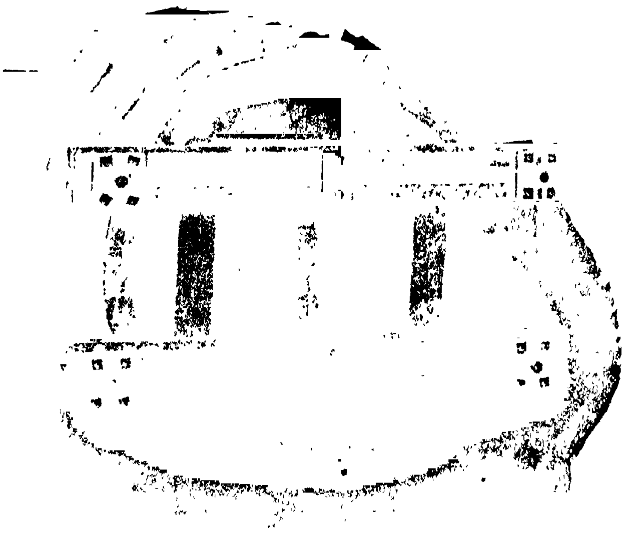
- Agitator Drives; Agitators; Agitator Fittings
- Blow Cases; Blow Tanks
- Cone Bottom Tanks
- Dust Collectors
- Dye Kettles
- Filter Tanks (Gravity and Vacuum)
- Half Round Tanks
- Kiers
- Montejus
- Oval Tanks; Round Tanks
- Settling Tanks
- Sprinkler Tanks
- Spray Tanks
- Storage Tanks
- Vats
- Steel Towers (for Storage and Sprinkler Tanks)
- Tanks for Special Purposes.

SERVICE:

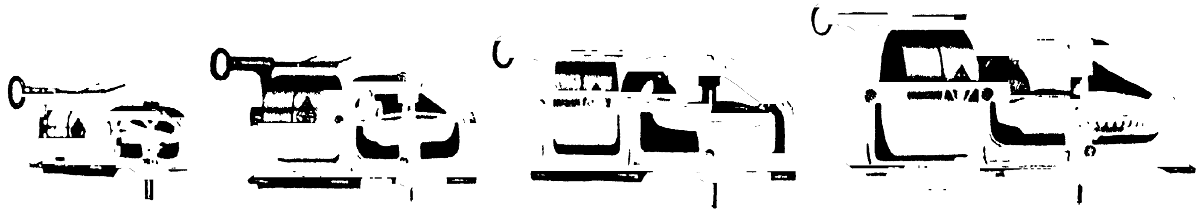
All inquiries will receive careful attention.



STANDARD DRIVE (SHOWING OVERHEAD MOUNTING)



WOOD PRESSURE TANK (DESIGNED FOR 50 LBS. PER SQ. IN.)



No. 0 No. 1 No. 1½ No. 2

BALL THRUST AGITATOR DRIVE (FOUR SIZES IN STOCK)

DIMENSIONS

Size	Pinion Shaft	Gear Shaft	GEAR		PINION		T. and L. Pulleys	Length Over All
			P. Diam.	Face	P. Diam.	Face		
No. 0	15/16"	1 3/16"	8"	1¼"	2"	1¼"	8" x 3"	1'-11"
No. 1	1 7/16"	1 15/16"	13.37"	2"	3.34"	2"	12" x 4"	2'-9"
No. 1½	1 7/16"	1 15/16"	16"	2½"	4"	2½"	12" x 4"	3'-2"
No. 2	1 15/16"	2 7/16"	23.87"	3"	5.97"	3"	18" x 5	4'-2"

NEW JERSEY FOUNDRY & MACHINE CO.

Manufacturers of Cranes, Trolleys and Hoists

90 West St.

NEW YORK, N. Y.

BRANCH OFFICE SAN FRANCISCO, CALIF., 156 SECOND STREET

Trade Mark Reg. Trade Mark Reg.

PRODUCTS

Cranes: Hand Power and Electric, Wall, Jib and Gantry.

Trolleys, I-Beam and Bar Type.

Portable Elevators.

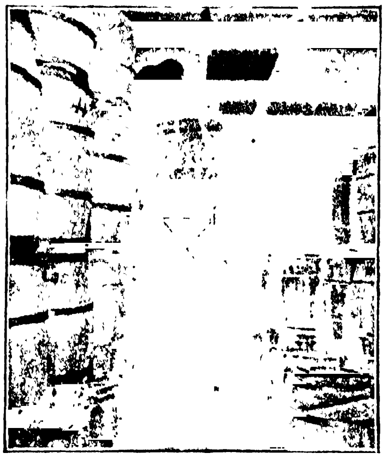
Equipment incidental thereto; Monorails.

PORTABLE ELEVATORS

Standard sizes are ¼, ½, ¾ and 1 Ton.

The standard over-all height is 12 ft., and standard size of platform is 2 ft. x 2 ft. x 7 ins.

Special capacities, heights and platform sizes made to comply with special requirements.



PORTABLE ELEVATOR PILING BARRELS

GANTRY CRANE WITH MOTOR DRIVEN TROLLEY HOIST

CRANES

Motor Driven and Hand Power.
Standard or Special to suit.
Practically Every Capacity and Span.

HAND POWER ICE CRANE WITH ELECTRIC HOIST

SPECIAL CRANE FOR WAREHOUSE

POWERHOUSE CRANE

MOTOR DRIVEN CRANE

CATALOG

The New Jersey Foundry and Machine Co.'s standard size (7½" x 10⅝") Catalog No. 100, covering overhead traveling cranes, will be sent on request, also special catalog on "Delta" Portable Elevators, trolleys and wall cranes.

NEW YORK BELTING & PACKING CO.

Manufacturers

Mechanical Rubber Goods

New York, 91-93 Chambers St
Boston, 65 Pearl St
Chicago, 124-126 West Lake St
Philadelphia, 821-823 Arch St

Pittsburgh, 420 First Ave.
St Louis, 218-220 Chestnut St
Salt Lake City, 313 Felt Bldg
San Francisco, 519 Mission St.

PRODUCTS

Belting—**Transmission, Conveyor, Elevator, Acid Resisting.**

Hose—**Acid, Steam, Water, Air, Fire Protection, Vacuum, Chemical, Coke, Gas, Oil, Gasoline, Suction.**

Packing—**Sheet Rubber, Asbestos, Superheat, Piston, Hydraulic, Gaskets.**

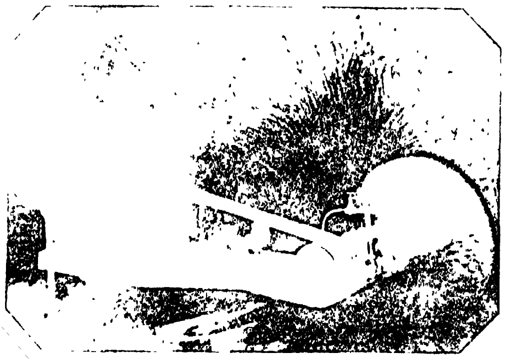
Pump Valves.

Grinding Wheels.

Special **Molded Goods, rubber cement, tubing, laboratory stoppers, mats.**

TEST SPECIAL TRANSMISSION BELTING

The highest quality belting for all power transmission purposes; main drives, line shaft, counter shaft and machine drives.



HOT SAW DRIVE—TACONY STEEL CO., PHILADELPHIA
TEST SPECIAL RUBBER BELTING EXPOSED TO HEAT, MOISTURE, SPARKS AND GRIT

Made from specially woven cotton duck of great tensile strength, the plies of which are inseparably bonded with a rubber friction that retains its adhesion under the hardest service. Waterproof, flexible, strong and durable. Withstands exposure to acid and chemical fumes, dust and grit. Has a friction surface which affords the maximum pulley grip.

Test Special Rubber Belting shows economy in initial cost and its freedom from stretch is a protection against trouble in operation.

ACID RESISTING BELT

Especially designed for places where the belt comes in direct contact with acids and chemicals.

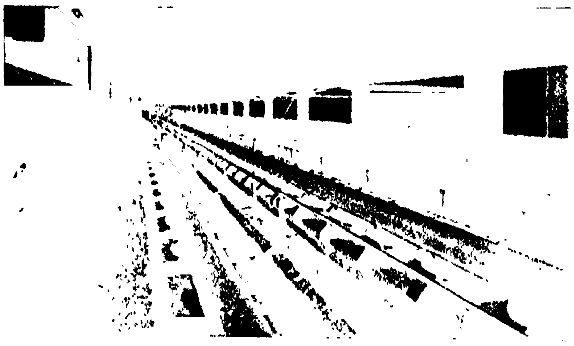
The construction is the same as **Test Special** with the addition of a thick rubber cover made of a tough rubber stock.

INDESTRUCTIBLE CONVEYOR BELTING

Gives maximum service under conditions that make the use of ordinary belting more costly in the long run

Indestructible possesses special features of particular value to the user.

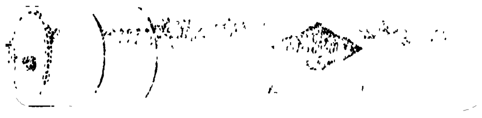
The cotton duck has great tensile strength to withstand excessive strains—the rubber friction uniting the plies is particularly strong and tenacious with a remarkable ageing quality. As the life of a belt is usually the life of the rubber cover, great care is exercised in selecting and compounding the stock for the cover of **Indestructible** Belts. The rubber cover can be relied upon to retain a strong adhesion to the fabric and to remain pliable throughout the life of the belt.



INDESTRUCTIBLE CONVEYOR BELTING

HOSE

For all classes of service, steam, water, air, acid, chemical, fire protection, gas, etc. Built on the **Indestructible** principle: Inner plies of wrapped duck over which is woven a fabric jacket of strong cotton yarns.



INDESTRUCTIBLE HOSE

PACKING

Packing for all purposes, steam, air, hot or cold water, acid, oil, chemicals, etc. Write us for packing catalog.

Indestructible White Sheet Packing is a rubber packing for general use. **Firo** Sheet Packing for superheat service. **Cobbs** Piston Packing for pressures to 150 pounds.

PUMP VALVES

Rubber Pump Valves for acids, oils, ammonia, hot or cold water and a variety of other uses and pressures.

VULCANITE GRINDING WHEELS

Emery bonded with rubber. Fast cutting, safe and economical.

CATALOGS

We issue a general catalog covering all principal products and special catalogs on the following: Test Special Belting, Packings, Vulcanite Grinding Wheels, Pump Valves.

NEW YORK CENTRAL IRON WORKS CO., INC.

Manufacturers of

Steel Tanks, Steel Plate Construction, and Equipment for the Chemical and Allied Industries

HAGERSTOWN, MARYLAND

PRODUCTS

Steel Plate Construction for the Chemical and Allied Industries:

- **Agitators, Chemical**
- **Agitators, Oil Refining**
- **Agitators, Steel**
- **Bins, Coal, Coke and Ore**
- **Breechings, Boiler**
- **Chimneys, Self-Supporting**
- **Dehydrating Apparatus**
- **Hoppers, Elevator**
- **Kettles, Mixing**
- **Kettles, Steam Jacketed**
- **Pans, Evaporating**
- **Pipe, Hydraulic Riveted**
- **Pipe, Welded**
- **Stills, for Crude Oils, creosote, coal, tar, etc.**
- **Soap Kettles**
- **Sugar and Syrup Kettles**
- **Air Ducts**

Tanks of all kinds including:

Acid
Agitator
Air Compressor
Bleaching
Cone Bottom
Cooling
Cyanide
Digester
Dissolving
Dye
Fresh Water
Fertilizer
Fuel Oil
Gas Works
Hydro-pneumatic
Jacketed
Mining
Mixing
Pressure
Pulp
Settling
Pulp Thickening
Sludge
Acid Separator
Soaking for Rubber
Sprinkler System
Storage
Sugar House
Tanners
Water Softening

SERVICES

To the chemical and allied industries particularly we offer ability to economically build from your most difficult specifications or cooperate with you in planning work on the most efficient yet practical basis.

LOCATION

Our location at Hagerstown, Maryland, on the main line of the Pennsylvania system with direct connection with the Norfolk and Western, Western Maryland, and Baltimore and Ohio, is ideal for shipment to any part of the United States, especially to points in the eastern and southern states. We are also close to the seaports, which is an advantage in making export shipments.

FACILITIES

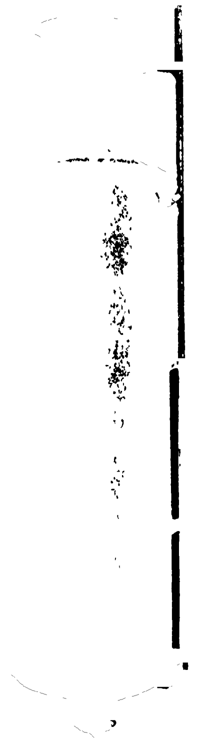
We have large, well equipped shops, capable of producing Fifteen Hundred tons per month, and carry on hand, at all times, a large stock of steel plates, structural materials, rivets, etc.

INQUIRIES AND SPECIFICATIONS

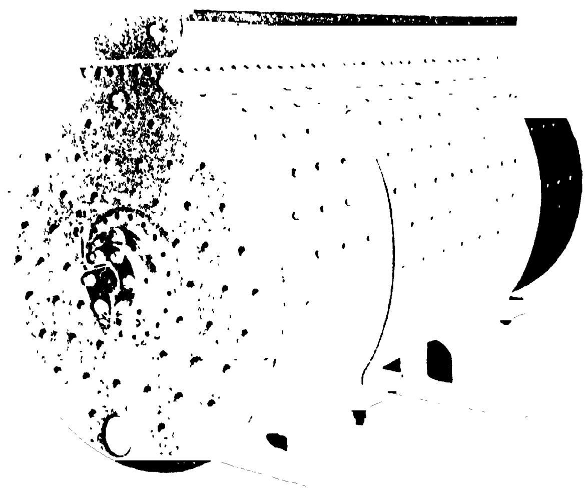
Inquiries accompanied by specifications will receive our prompt and careful attention.

ERECTION

We erect tanks and structural work anywhere in the United States of America.



VERTICAL STILL
Constructed to customer's specifications



OLEOMARGARINE CHURN
Constructed to customer's specifications

NEW YORK THERMOMETER COMPANY

36 East 23rd Street
NEW YORK, N. Y.

FACTORY
Palmetto Street
Brooklyn N Y

Cable Address
"NYTHCO", New York

PRODUCTS

- Thermometers
- Hydrometers
- Pyknometers
- Saccharometers
- Hydrometer Jars and Cans
- Test Tubes

THERMOMETERS

We manufacture all kinds of Thermometers for use in chemical laboratories, chemical manufacturing and industrial plants.

Grades—Laboratory, Standard and Extreme Precision, with or without armored cases

Types—Our standard grade thermometers are made in three general types.

(a) With glass cylinder and enclosed, insulated paper scale.

(b) With glass cylinder and enclosed, insulated porcelain scale;

(c) With scale etched on stem.

Laboratory Grade

High quality thermometers, carefully made, and primarily intended for routine work and other use where frequent breakage precludes the use of more expensive instruments.

LABORATORY THERMOMETERS
With engraved stems, or enclosed porcelain scales

Length	Graduations
12 inches	110° C or 220° F
12 "	150° C or 300° F
14 "	200° C or 400° F
14 "	250° C or 500° F
16 "	300° C or 600° F
16 "	360° C or 700° F
12 "	220° F and 110° C
12 "	300° F and 150° C
14 "	400° F and 200° C
16 "	600° F and 300° C
16 "	700° F and 360° C

Standard Grade

For use in all work where readings to fractions of a degree are not required, but where, nevertheless, highly reliable, permanently accurate instruments are needed.

STANDARD GRADE THERMOMETERS
With engraved stems, or enclosed porcelain scales

Length	Graduations
15 inches	220° F
15 "	300° F
15 "	400° F
15 "	600° F
16 "	700° F
16 "	800° F.
15 "	100° F
15 "	150° F
15 "	200° F.
16 "	360° F
15 "	110° C and 220° F
15 "	150° C and 300° F
15 "	200° C and 400° F
16 "	300° C and 600° F
16 "	80° to 350° F for Sulfite Mills

Extreme Precision Grade

For use where extreme accuracy and refinement of indication are required, such as important laboratory or test work, and for checking less accurate thermometers.

We manufacture Allihn, Anschuetz, Beckmann and other thermometers in this grade. Specifications sent on request. Thermometers of extreme precision with special graduations made to order

HYDROMETERS

Are all hand graduated, adapted for every purpose. All these hydrometers, unless otherwise specified, are graduated for temperature 60° F. Made with printed scale, on request.

Medium Grade

Of closer scales and somewhat less sensitive than the Standard Grade, adapted for most purposes.

Standard Grade

Of greater sensitiveness, should always be used for close accuracy and for exact work

We make a Hydrometer for every purpose in any of the usual scales, among which are:

Balling
Brix
Proof
Baumé
Kaiser
Tralle

Where necessary a thermometer is incorporated with the hydrometer.

Hydrometers with special scales made to order.

Adaptability of our Hydrometers.

Our Hydrometers are used with constant success for Alcohol, Alkali, Ammonia, Calcium chloride, Caustic soda, Chlorine, Cider, Coal oil, Crude oil, Ether, Gasoline, Glue, Glycerine, Grape juice, Milk, Linseed oil, Naphtha, Oil, Petroleum, Salt, Sea water, Sugar, Sirup, Vinegar, Wine; for Specific Gravity, in the case of heavy liquids or light liquids; and for many other purposes.

PYKNOMETERS

We produce the standard Pyknometer (Specific gravity bottle) with perforated stopper, unadjusted in three sizes.

10 cc. 25 cc. 50 cc.

We also furnish these Pyknometers, accurately adjusted at 20° C., capacities:

10 cc. 25 cc. 50 cc. 100 cc.

Pyknometers adjusted at other temperatures produced at short notice.

Pyknometers with porcelain scale, centrigrade thermometer, graduated to 1/5°, with capillary side-tube having a ground glass cap to prevent evaporation or overflow:

10 cc. 25 cc. 50 cc. 100 cc.

HYDROMETER JARS

Glass Hydrometer Jars with foot and lip suitable for use with our various Hydrometers are carried in stock in the following sizes:

Diameter	Height
1½ inches	8 inches
2 "	10 "
2 "	12 "
2 "	14 "
2 "	16 "
2 "	18 "
2½ "	18 "

CATALOG

Illustrated Catalog and Price List sent on request.

NORDBERG MANUFACTURING COMPANY

Designers and Builders of Engines, Mine Hoists, Compressers, Condensers, Chemical Machinery, and Special Castings for the Chemical Industry

MAIN OFFICE AND WORKS: MILWAUKEE, WISCONSIN

PRODUCTS

Diesel type stationary and marine engines; Corliss Engines and Uniflow Poppet Valve Engines; Steam, Air, and Electric Mine Hoists; Air and Gas Compressors; Blowing Engines, Vacuum Engines for multiple effect; Steam Stamps and Condensers; Special Machinery and Castings for the Chemical Industry.

NORDBERG MACHINERY

COMPRESSORS FOR CARBON DIOXIDE GAS

Two Nordberg Carbon Dioxide Gas Compressors were recently shipped to a large firm in China. They are of the duplex Corliss type, which compress the gas to 40 pounds with a steam pressure of 160 pounds and a back pressure of 10 pounds. Exhaust steam is used for heating. The capacity of each compressor is 3000 cu. ft. at 80 R P M. and they are provided with mechanically operated inlet valves, automatic poppet outlet valves, and other special features to enable them to handle gas containing impurities. Large sizes are provided with floating gas pistons, which are supported by front and back crossheads to eliminate wear.

These compressors are always built to meet special local requirements; in some instances the cylinders are provided with removable liners and the inlet valves with removable seats, so that these parts may be readily removed for reboring without dismantling the balance of the machine. In plants using superheated steam, the steam ends are provided with poppet valves. Most carbon dioxide compressors operate in plants requiring exhaust steam for heating, but in special cases, when desired, the steam ends are made condensing with the attendant low steam consumption.

The reliability and long experience in this special field of compressor manufacture were the factors which influenced this Chinese company in placing the order with the Nordberg Manufacturing Company.

COMPRESSORS FOR NATURAL AND ARTIFICIAL GAS

Because natural gas contains a large amount of grit and other impurities, special attention has been given to the design of Nordberg Gas Compressors. Heavy duty cross-compound condensing steam engines are used, and the cylinders of the single stag compressor have poppet inlet and outlet val Nordberg builds this type of compresso standard sizes up to 45″ x 60″. Large units h floating gas pistons to eliminate wear, tail gu being provided in front of and in back of gas cylinder. The guides are bored to fit th shoes attached to the gas piston rods.

Some of the larger users of these compres are the Carnegie Natural Gas Company, Mon gahela Natural Gas Co., The Philadelphia Compa and the Pittsburgh & West Virginia Gas Comp Nordberg has built these special compressors for 2 years and have just completed seven cylinders for th last named company.

HIGH-PRESSURE OXYGEN COMPRESSORS

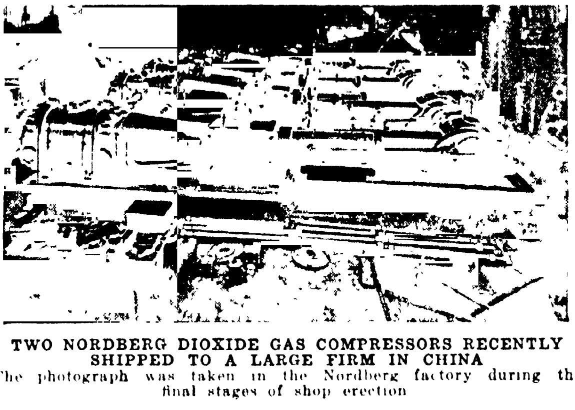
Among the many special types of compressors built for compressing various gases, the high pressure oxygen compressors are especially interesting.

These machines are of vertical, three-stage type and are capable of compressing the oxygen to 200 atmospheres. They are entirely self-contained, the three cylinders being mounted on a unit frame with the driving pulling at one end. Automatic poppet type valves are used and these are ground to fit on the seats. The cylinders, cylinder heads, valves and pistons are made of bronze. The cylinders are surrounded by water jackets and in the spaces between the cylinders and water jackets are immersed the coils which form the coolers between the several stages of compression. The frames of these special compressors are entirely enclosed and have removable plates for inspection of running gear and bearings.

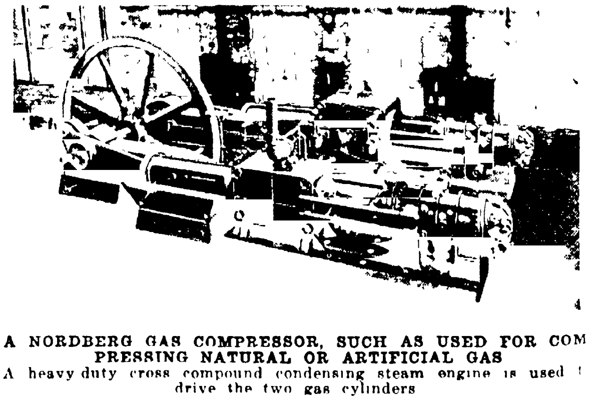
AIR COMPRESSORS

The range of types and sizes of Nordberg Air Compressors meet the demands of all requirements from low pressure single-stage to high pressure three-or four-stage. In units of one or two stages, a maximum capacity of 12,000 cu. ft. per minute can be provided.

Compound condensing or non-condensing Corliss engines are used for the steam ends and in cases where exhaust steam heating is employed, duplex Corliss engines are used. In modern plants using high pressure superheated steam, Nordberg Uniflow Poppet Valv



TWO NORDBERG DIOXIDE GAS COMPRESSORS RECENTLY SHIPPED TO A LARGE FIRM IN CHINA
The photograph was taken in the Nordberg factory during the final stages of shop erection



A NORDBERG GAS COMPRESSOR, SUCH AS USED FOR COM PRESSING NATURAL OR ARTIFICIAL GAS
A heavy duty cross compound condensing steam engine is used drive the two gas cylinders

Continued on Next Pag

TWO NORDBERG UNIFLOW POPPET VALVE ENGINES DRIVING ROTARY BLOWERS AT THE LA CLEDE GAS LIGHT CO, ST. LOUIS, MO.

Uniflow Engine is especially suited to drive gas boosters since the speed of the engine is varied to meet requirements

es are used, the compressor being connected at the outboard end of the engine crankshaft

Standard compressors are provided with Nordberg automatic inlet and outlet valves arranged in a cylindrical plug or seat so that the whole set of inlet or outlet valves may be removed as a unit.

Multi-stage compressors are provided with intercoolers and water-jacketed cylinders and cylinder heads. These Nordberg Air Compressors are driven by either Nordberg Diesel Engines, Uniflow Engines, or electric motors. The motors may be belted or direct connected, and when direct connected, the compressors are a high speed type to suit the motor requirements.

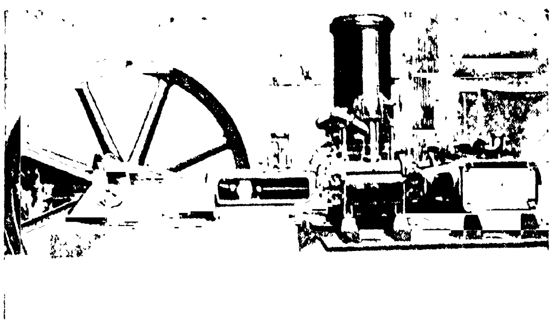
VACUUM ENGINES

In some branches of the chemical industry where a very high vacuum is required in the manufacturing process, Nordberg Vacuum Engines are employed. These multiple effect engines are built with special cylinders which, by means of a trick port, by-pass the air left in the clearance space from one end of the cylinder to the other. The cylinders are water-jacketed and have positive driven Corliss valves. A vacuum within a fraction of an inch of absolute may be produced. These Vacuum Engines for multiple effect are driven by cross-compound condensing or duplex non-condensing Nordberg Engines.

UNIFLOW ENGINES FOR ROTARY BLOWERS

Operators of modern gas plants, using high pressure superheated steam, realize the importance of installing engines especially adapted to these conditions. Where Nordberg Uniflow Poppet Valve Engines are employed to drive gas boosters, a steam consumption as low as 10 lbs. per I.H.P. hour is secured with high pressure and superheat. The rate of steam consumption does not vary more than 10 per cent from loads ranging from 50 to 125 per cent of normal. The efficiency, too, changes but slightly with variations in discharge pressure. When used for blower drive, Nordberg Uniflow Poppet Valve Engines are equipped with a device which varies the speed of the engine to meet the blower capacity required.

These engines are widely used for driving generators and other constant speed machinery, as well as a large variety of variable speed machines. They are built in several sizes, ranging from 200 to 1300 H.P. for single cylinders. The speed of the smaller standard sizes is [illegible] R.P.M. and the larger sizes 120 R.P.M. Variations from these speeds can be made to suit special conditions and the engine may be operated either condensing or non-condensing, or with high back pressure and with any steam pressure and superheat. A Nordberg Uniflow Poppet Valve Engine operating under any of these conditions will maintain a lower steam consumption over wider variations in load than any other form of steam prime mover.



A NORDBERG COMPOUND CONDENSING CORLISS ENGINE DRIVING A NORDBERG TWO STAGE AIR COMPRESSOR WITH LARGE INTERCOOLER

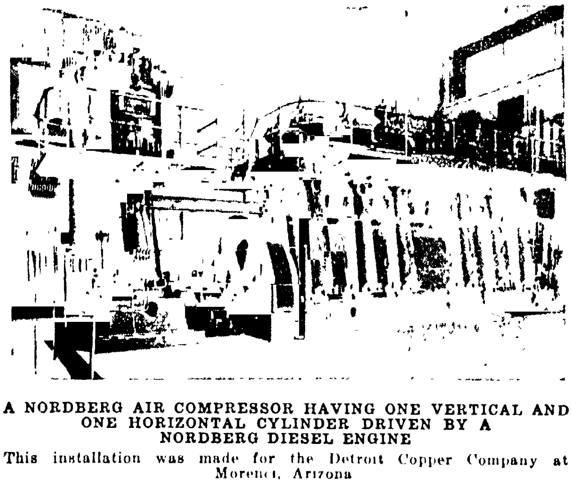
Nordberg Air Compressors may be driven by Corliss, Uniflow or Diesel Engines or by motors as conditions warrant

DIESEL TYPE OIL ENGINES

Nordberg Diesel type oil engines are especially adapted for heavy duty work, and range in sizes from 300 to 3000 B.H.P. For stationary service they are used extensively in electric light and power plants, flour mills, mining industries, machine-shops, textile works, cement industries, water works, shipyards, chemical works, refineries, compressor plants, irrigation plants, ice manufacture, etc. Nordberg Diesel engines are made for either constant or variable speed and burn a large variety of fuel oils with exceptional economy. Particular attention is called to the large sizes of Nordberg Diesel units.

SPECIAL MACHINERY

The Nordberg Manufacturing Company has built a large number of compressors for special purposes, such as oxygen compressors for 200 atmosphere pressure, hydrogen and nitrogen circulators, vacuum engines for multiple effect; evaporators and air expansion engines for production of extremely low temperature; and many large and special castings for use in the chemical industry. The company is prepared to build large and special machinery to meet unusual requirements. State the conditions to Nordberg.



A NORDBERG AIR COMPRESSOR HAVING ONE VERTICAL AND ONE HORIZONTAL CYLINDER DRIVEN BY A NORDBERG DIESEL ENGINE

This installation was made for the Detroit Copper Company at Morenci, Arizona

NORTON COMPANY

MAIN OFFICE AND WORKS
WORCESTER, MASS.

ELECTRIC FURNACE PLANTS
Niagara Falls, N. Y.
Chippawa, Ontario, Canada

BRANCH OFFICES
11 N. Jefferson St., Chicago
251 W. Congress St., Detroit
151 Chambers St., New York

PRODUCTS

Alundum and Crystolon Refractories and Laboratory Ware, Grinding Wheels, Abrasive Grain, Alundum Safety Tile, Abrasive Bricks and Stones and Grinding Machinery.

REFRACTORIES AND LABORATORY WARE

Capsules	Muffles
Combustion Boats	Tubes
Crucibles	Pyrometer Tubes
Cores	Refractory Cements
Dishes	"RR" Alundum
Extraction Thimbles	(Crystalline Alumina)
Filter Plates	Sintered Magnesia

"ALUNDUM" REFRACTORIES

Electrically fused Alumina (Al_2O_3), melting point 2050 C., is important as a Refractory as well as an abrasive. This electric furnace product is of different degrees of purity depending on intended use. The purest forms run not less than 99% aluminum oxide. The less pure grades contain small amounts of the oxides, iron, titanium and silicon. Its specific gravity is 3.91 and specific heat 0.195 to 0.198 at 100° C.

Through proper selection of ceramic bonding materials and heat treatment refractory articles are made having a melting point somewhat less than pure alumina depending entirely on the mixture.

Alundum bonded ware is relatively strong, has a high heat conductivity and an electrical resistance at high temperatures greater than the usual refractory materials. On account of these properties and its inertness toward resistors of platinum, molybdenum, nickel and its alloys, various shapes are used in heating devices.

Except in the case of Pyrometer tubes Alundum ware is porous and used in the filtration of acids and gases and also for the diffusion of gases. Three porosities available in crucibles, thimbles and filter cones

"CRYSTOLON" REFRACTORIES

Silicon Carbide (SiC) is formed in electric furnaces of the resistance type at temperatures between 1820 C. and 2250 C. from pure silica sand, coke and small quantities of salt and sawdust. At about 1500° C. Crystolon firesand, a soft dark green colored substance having useful refractory properties is formed. This is converted as the temperature increases into Crystalline SiC, the crystals of which are beautiful in iridescent colors. Above 2250 C. silicon vaporizes from the compound, leaving a residue of graphite.

Silicon Carbide having a high heat conductivity is valuable on this account and also on its high dissociation point, 2250 C.

When made up into muffles, furnace tile and parts, proper ceramic refractory bond clays produce "Crystolon" ware that is not readily oxidized and only attacked by hydrofluoric acid. At high temperatures metallic oxides, alkali compounds and strong alkalies attack it.

PROPERTIES OF NORTON REFRACTORIES

	"Alundum" Ware	"Crystolon" Ware
Electrical Resistance in Megohms	130 at [illegible] C 16 at 730 C 5.1 at 892 C 1.8 at 1020°C	31.8 at 320°C 6.1 at 650°C 3.2 at 809°C 1.9 at 910°C 0.4 at 1040°C
Melting Point . . .	less than alumina depending on mixture	decomposes at 2250°C
Coefficient of expansion	0000071 per°C	0000045°C.

ELECTRICALLY SINTERED MAGNESIA

This material is prepared from the best grade of California Magnesite in an electric furnace. Further shrinkage is eliminated as maximum density has been attained, 3.65. It is attacked by carbon at about 1800° C. Its general chemical properties are similar to "dead burned" Magnesite. The melting point varies according to purity, between 2300° and 2700° C. This product can be supplied in lump or crushed form. It is used in making magnesia crucibles and basic refractory linings.

MUFFLES CORES PYROMETER TUBE CRUCIBLES CEMENT DISCS "RR" ALUNDUM DISH CONES THIMBLES TUBES COMBUSTION BOATS

THE OAKLAND COPPER & BRASS WORKS

Chemical Engineers and Constructors

GENERAL OFFICES AND WORKS
OAKLAND, CALIFORNIA, U. S. A.

Cable Address
"ZEITLER"
ABC [illegible] Edition

Philadelph
3519 North

PRODUCTS

- Evaporators
- Distilling Apparatus
- Extractors
- Vacuum Pans
- Kettles
- Condensers
- Solvent Recovery Apparatus
- Special Chemical Machinery
- Tin and Lead Lined Apparatus
- Coppersmithing

SERVICES

We design, build and install all types of apparatus for evaporating, distilling, pasteurizing, heating, cooling, and condensing for practically all products handled in the canning, packing, milk products, food products, chemical and allied industries.

EVAPORATORS

We design and construct apparatus of any capacity for all products, in single or multiple effects, to work under pressure or vacuum. Our machines are properly designed and constructed to give a maximum efficiency both as regards evaporation and cooling water consumption.

SINGLE EFFECT VERTICAL TUBE VACUUM EVAPORATOR WITH SURFACE CONDENSER AND DRY VACUUM PUMP

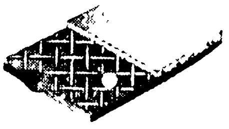
We offer, gratis, for experimental purposes the use of the above illustrated high vacuum concentrating equipment, including also an agitated vacuum Finishing Pan (similar to that illustrated in the cut of the Fruit Butter installation) for heavy concentrates. Details will be furnished upon application.

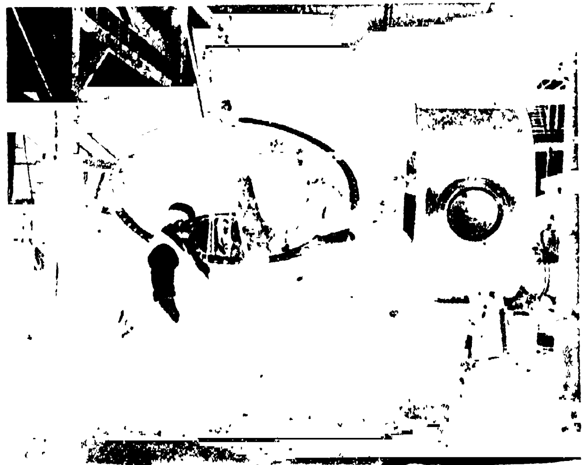
A FRUIT BUTTER INSTALLATION

Consisting of a single effect vertical tube vacuum evaporator fo the initial concentration, and a steam jacketed agitated va finishing pan for making the finished product

VACUUM PANS

Our Pans are of the Jacket or of the Coil types and are built in all sizes. We have designed and built many special types of Pans to suit customer's requirements. Our special steam jacketed Mixing Vacuum Pan having a steam heated revolving coil fitted with scrapers and carried on a horizontal shaft, the coil acting both as a heating unit and an agitator, obtains without difficulty a degree of concentration approaching a solid.



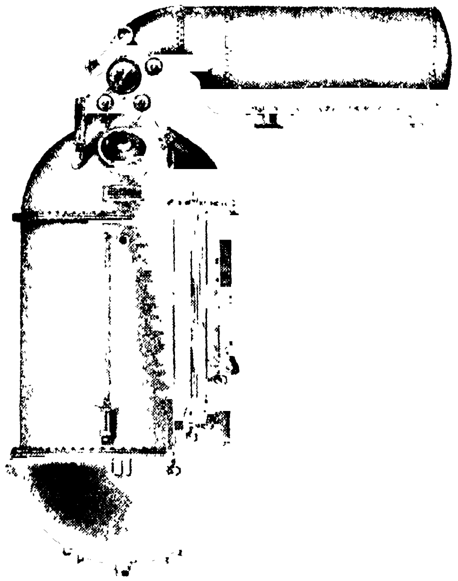


STEEL SHELL, "ZEITLER" LEAD-LINED COIL HEATED VACUUM PAN

Detail at top illustrates Zeitler method of lining. Patented Jan ary 22, 1918

Continued on Next Pag

ther special apparatus as illustrated in the ac-ving illustration is a vacuum pan of steel with tler" Patented Homogeneous Lead Lining and ad heating coils. Several of these Pans have service concentrating citric acid since early in orking under a high vacuum, and the linings et to show a tendency to sag, creep or separate e outer shell. This kind of service can be read-ciated by those who have had experience in to operate under a vacuum the ordinary type of apparatus wherein the lining is simply soldered outer shell.



VACUUM PAN AND CONDENSER

For Manufacture of Evaporated and Condensed Milk

EXTRACTORS

We construct extraction apparatus of the batch type with apparatus for the recovery of solvents; also, of the continuous diffusion battery type.

KETTLES

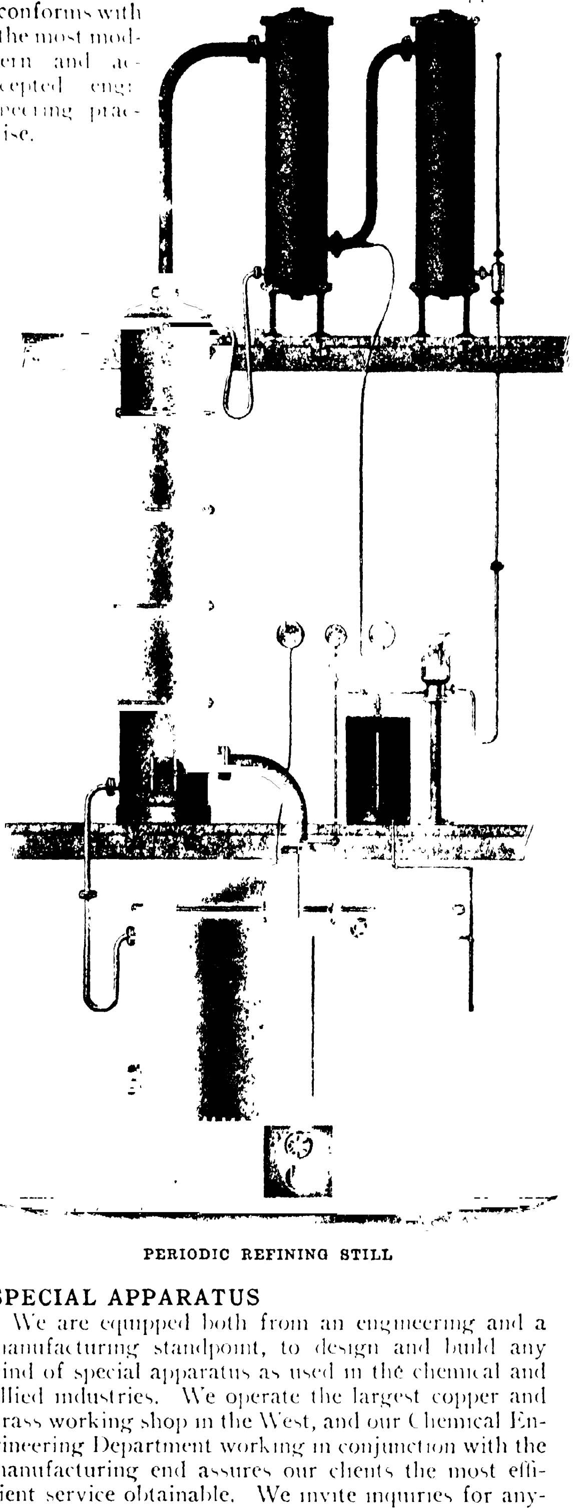
We build all sizes and types of Jacket Kettles, Mixing Kettles, Tilting Kettles, etc.

The illustration shows part of a single installation of 32 350-gallon copper jacket kettles which were lined with pure block tin a quarter of an inch thick.

350-GALLON COPPER JACKET KETTLES

DISTILLING APPARATUS

Illustration shows a periodic refining still of copper. We build all types of distilling apparatus, continuous or periodic, to operate either under a vacuum or at atmospheric pressure, to handle almost any volatile liquid, and constructed of the proper material for the liquid being handled. The design of our apparatus conforms with the most modern and accepted engineering practise.



PERIODIC REFINING STILL

SPECIAL APPARATUS

We are equipped both from an engineering and a manufacturing standpoint, to design and build any kind of special apparatus as used in the chemical and allied industries. We operate the largest copper and brass working shop in the West, and our Chemical Engineering Department working in conjunction with the manufacturing end assures our clients the most efficient service obtainable. We invite inquiries for anything from a single piece of apparatus to a completely installed plant.

O'MALLEYS COOPERAGE, INC.

Berry and North 13th Streets
BROOKLYN, N. Y.

Telephones GREENPOINT [illegible]

PRODUCTS

Barrels, Slack and Tight
Kegs and Casks
Wood Tanks, Vats and Drums
Cooperage Stock
Packing Cases and Shooks
Bag Coverings

BARRELS

As we maintain a large supply of cut stock and second hand barrels we are at all times in a position to supply or ship on short notice new barrels, set up or knocked down, or second hand barrels, either tight or slack. Our barrels are of the standard woods and sizes.

COOPERAGE

We have several crews of men who are always ready to go to piers and terminals to recondition barrels loosened up in transit.

We also contract to barrel, in the New York Harbor district, export shipments made in bulk by manufacturers at interior points. This service costs no more than barreling at the plant, and saves the rail freight on barrels. It also permits loading heavier cars, and loading them quicker.

This same class of service is rendered importers receiving bulk cargoes for re-shipment by rail to interior points. The savings and advantages are the same in this case as for export.

All that is necessary to do to have us undertake cooperage service is send your order with dock rec or bill of lading and shipping instructions. We take care of the trucking and advancement of fre charges, billing for the entire job on one itemized b

It will be of advantage to shippers and receivers of bulk shipments to investigate the cost, savings and advantages of this service as against shipping in barrels the entire distance.

We will also handle shipments received in barrels where re-shipment is to be made in bulk. In this case we will make allowances for barrels, depending on their condition, and deduct from our bill for service

TANKS

We build complete tanks to specification, working from drawings supplied by customer. O'Malley tanks are built of any size and in any shape that it is practical to construct wooden tanks.

Our tank stock is cut from well seasoned timber and allowed to finish seasoning before being built into tanks.

We maintain a large supply of the best woods available for tank construction, cypress, redwood, cedar

Each tank is properly banded or braced to withstand internal and external strains and stresses.

Where tanks are to be fitted with spouts, stirrers, agitators or other devices and accessories we will purchase the equipment specified and fix it in place in a proper manner. Where no special make of fitting or accessory is ordered we purchase the best obtainable

SECTION OF COOPERING SHED

HOGSHEADS PREPARED FOR EXPORT

JOSEPH OAT AND SONS

Established 1788

Coppersmiths, Machinists, and Brass Founders

228-234 Quarry Street

PHILADELPHIA, PA

PRODUCTS

Every Kind of Copper Chemical Equipment.

Especially,

- Vacuum Pans
- Milk Condensing Pans
- Multiple Effect Evaporators
- Vacuum Concentrating Apparatus
- Dreg Stills
- Vacuum Distilling Apparatus of all Kinds

Also,

- Coils, Condensing
- Coils, Heating
- Columns, Fractionating
- Condensers
- Copper Tanks
- Digestors
- Distilled Water Equipment
- Extractors
- Jacketed Tanks
- Jacketed Kettles
- Jacketed Stills
- Jet Condensers
- Kettles for all Purposes
- Kettles, Mixing
- Kettles, Varnish
- Kettles, Vacuum
- Kettles, Steam Jacketed
- Milk Forewarmers
- Percolators
- Rotary Coil Vacuum Pans for Solid Extract
- Solvent Recovery Apparatus
- Stills, Water
- Stills, Vacuum
- Stills, Dreg
- Surface Condensers
- Tanks, Storage
- Tanks, Mixing
- Tanks, Pressure
- Tanks, Heating
- Tanks, Cooling
- Tanks, Dissolving
- Vats, Copper

VACUUM PANS

Our Vacuum Pans range in size from sixteen inches in diameter for laboratory experimental purposes to sixteen feet in diameter for sugar manufacturers.

Vacuum Pans for milk and other food products a specialty.

We build vacuum stills for pharmaceutical laboratories with or without receivers for recovered distillate, and for aqueous or alcoholic solutions.

Single or double stirring devices are supplied when desired.

EVAPORATORS

Single and multiple effect evaporators for tanning extracts, calcium chloride, caustic soda, licorice and sugar solutions.

Evaporating apparatus designed for special products.

Our evaporators are designed to facilitate rapid circulation and evaporation without entrainment, with ample vapor areas avoiding excessive vapor speed, large drain connections and provision for elimination of air from heating chambers.

OLIVER CONTINUOUS FILTER COMPANY

505 Market Street
SAN FRANCISCO, CALIF.

11 Southampton Road
London, W. C. 1

Laboratory, 503 Market Street

33 West 42nd Street
New York

Cable Address "OLICONFILT"

Laboratory, 226 East 41st St.

PRODUCTS

Continuous Automatic Vacuum Filters for separating liquids from solids; Horizontal Continuous Filter Tables, Vacuum Pumps, Centrifugal Pumps, Air Compressors, Acid Pumps.

GENERAL DESCRIPTION

The Oliver Continuous Filter consists of a drum or cylinder, revolving partially submerged in an open tank containing the material to be filtered. The surface of the drum is divided into shallow compartments, being supported underneath by a screen and held in place and protected from wear by a wire winding, the use of which is covered by our patents.

Each section of the drum is connected by a pipe passing through a hollow trunnion to an automatic valve, which controls both the application of vacuum for forming and washing the cake, and the admission of air for its discharge and for cleansing the filter medium. Provision is made for applying such washes to the cake as may be needed for complete replacement of solution. The main filtrate may be kept separate from wash solution with no extra labor.

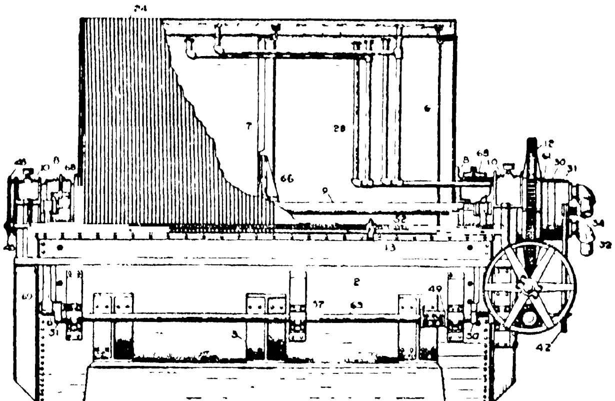
A scraper fitted across the tank rests on the wire winding in such a manner that the cake is entirely removed after being released by air.

An agitator suitable for the material to be filtered is placed in the bottom of the tank to keep the heavier particles in suspension, and to insure a uniform and homogeneous mixture.

Provision may be made for heating the pulp in the filter tank or to prevent any loss of heat due to radiation. Losses or increases of temperature are easily prevented.

WASHING FILTERS

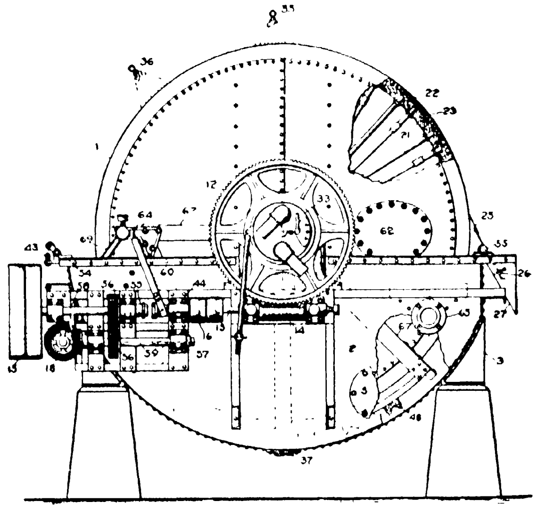
Used where filtration and efficient washing are desired as in the filtration of caustic soda from lime sludge, or the separation of any Alkaline or Acid Solutions from precipitates. In the filtration of both Hot and Cold Saccharate and First Carbonation Juice in Beet Sugar Factories. For the separation of Bicarbonate of Soda, Salt and other crystals from mother liquors, Nitrate of Soda from caliche, etc., and for the recovery of cyanide solution in the reduction of gold and silver ores. Used extensively in factories producing Starch, Glucose, Caustic Alkalies, Dyes, Pigments, Phosphate of Lime, etc.; also in Clay preparation and oil clarification in oil refineries.



FILTER WITH OSCILLATING AGITATOR AND ENCLOSED HEADS

List of Parts

1. Filter Drum
2 Steel Filter Tank
3. Tank Supports
5. Tank Manhole
6 Channel Steel Drum Rims
7. Channel Steel Drum Arms
8. Hollow Cast Iron Trunnion
9. Steel Drum Shaft
10 Main Bearings
12. Worm Drive Gear
13 Worm Shaft
14 Oilwell for Worm
15 Drive Pulleys
16. Wiring Pulleys
18 Bevel Gears
21 Wood Staves for Drum
22 Division Strips
23 Filter Medium
24 Wire Winding
25 Steel Scraper
26 Scraper Adjuster
27 Apron
28. Vacuum and Air Pipes
30 Removable Valve Seat
31 Automatic Valve
32 Vacuum Connections
33 Air Connection
34. Valve Stem



FILTER WITH OSCILLATING AGITATOR AND ENCLOSED HEADS

List of Parts

35 Wash Water Sprays
36 Wash Solution Sprays
37 Drain Flange
42 Valve Adjuster
43 Wire Spacing Nut
44 Worm Shaft Bearings
45 Wiring Sprockets
48 Oscillator Rakes
49 Shaft Coupling
50. Agitator Crank
51 Agitator Crank
52. Wiring Feed Screw
53. Jaw Clutch
54. Wiring Screw Bearings
55. Scraper Bearings
56 Spur Gear
57 Oscillator Shaft Bearings
58 Pulley Shaft
59 Intermediate Shaft
60 Clutch Shifter
61. Valve Pipe Plate
62 Drum Manhole
63. Oscillator Shaft
64 Connecting Rod Bracket
65. Overflow Weir
66. Center Spider
69. Connecting Rod

Continued on Next Page

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- Vacuum Distilling Apparatus of all Kinds

Also,

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- Coils, Heating
- Columns, Fractionating
- Condensers
- Copper Tanks
- Digestors
- Distilled Water Equipment
- Extractors
- Jacketed Tanks
- Jacketed Kettles
- Jacketed Stills
- Jet Condensers
- Kettles for all Purposes
- Kettles, Mixing
- Kettles, Varnish
- Kettles, Vacuum
- Kettles, Steam Jacketed
- Milk Forewarmers
- Percolators
- Rotary Coil Vacuum Pans for Solid Extract
- Solvent Recovery Apparatus
- Stills, Water
- Stills, Vacuum
- Stills, Dreg
- Surface Condensers
- Tanks, Storage
- Tanks, Mixing
- Tanks, Pressure
- Tanks, Heating
- Tanks, Cooling
- Tanks, Dissolving
- Vats, Copper

VACUUM PANS

Our Vacuum Pans range in size from sixteen inches in diameter for laboratory experimental purposes to sixteen feet in diameter for sugar manufacturers.

Vacuum Pans for milk and other food products a specialty.

We build vacuum stills for pharmaceutical laboratories with or without receivers for recovered distillate, and for aqueous or alcoholic solutions.

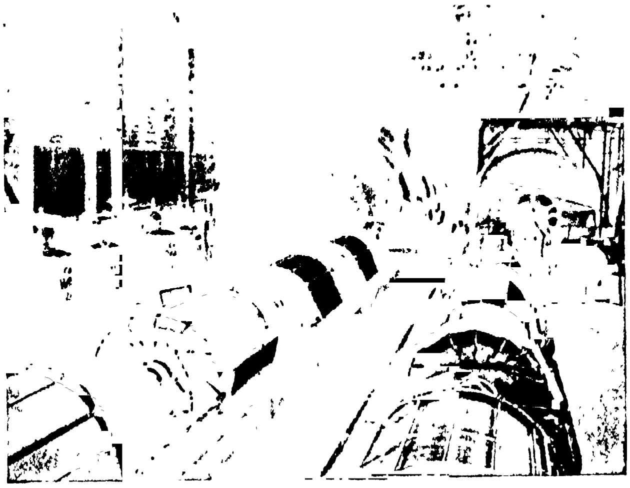
Single or double stirring devices are supplied when desired.

EVAPORATORS

Single and multiple effect evaporators for tanning extracts, calcium chloride, caustic soda, licorice and sugar solutions.

Evaporating apparatus designed for special products.

Our evaporators are designed to facilitate rapid circulation and evaporation without entrainment, with ample vapor areas avoiding excessive vapor speed, large drain connections and provision for elimination of air from heating chambers.



A TYPICAL INSTALLATION IN STEFFENS HOUSE OF A BEET SUGAR FACTORY

Ten 11'6" x 12', eight 4'0" x 6' and two 5'4" x 4' filters at Spreckels Sugar Factory, Spreckels, Cal

OLIVER FILTER SIZES

Filters in any of following sizes will be built to suit the individual requirements of any plant on receipt of full particulars.

Diameter	Length	Area Sq Ft	Diameter	Length	Area Sq Ft.
3'0"	0'6"	4	8'0"	10'0"	250
3'0"	1'0"	9	8'0"	12'0"	300
3'0"	2'0"	18	11'6"	8'0"	288
3'0"	4'0"	36	11'6"	10'0"	360
4'0"	2'0"	25	11'6"	12'0"	432
4'0"	4'0"	50	11'6"	14'0"	504
4'0"	6'0"	75	11'6"	16'0"	576
5'4"	4'0"	70	11'6"	18'0"	648
5'4"	6'0"	105	11'6"	20'0"	720
5'4"	8'0"	140	14'0"	14'0"	616
5'4"	10'0"	175	14'0"	16'0"	704
5'4"	12'0"	210	14'0"	18'0"	792
8'0"	6'0"	150	14'0"	20'0"	880
8'0"	8'0"	200	14'0"	24'0"	1056

CAPACITIES

The quantity of solid or liquid that can be handled per unit of filter area depends upon many factors, all of which have to be considered when estimating the size of filter required. The most essential data are the physical condition of the solids, whether granular or colloidal, size of particles, ratio of solids to liquid, and temperature at which filtration is to be conducted.

Following are the average amounts of dry solids that can be handled in 24 hours on one square foot of Oliver Filter surface:

Ore slime, 400 lbs
Flotation concentrate, 600 lbs.
Cold saccharate from 200 lbs molasses
Hot saccharate from 1200 lbs molasses
Bicarbonate of soda, 2500 lbs
Calcium carbonate in causticizing plants, 750 lbs.
Prepared clay for oil refining, 600 lbs
Lubricating oil, clarified, 240 gals
Maltose sludge, 160 gals.
Paper pulp, 500 lbs. dry pulp.
Starch, 1200 lbs.

ADVANTAGES

Continuous and automatic in action without l in cycle of formation, washing, drying, or dischar cake. All stages visible, accessible and easy of ad ment. Economy of labor, power, cloth and rep High washing efficiency with a minimum of w water. Filters effectively either hot or cold.

OPERATING COSTS

Depend on tonnage and nature of material han but range from 3c to 5c per ton of dry solids. M tenance and cloth renewals ¼c to ½c.

WASHING EFFICIENCY

The Oliver system of applying an atomized wash over the uniform and relatively thin cake which i always in sight of the operator, insures a maximum replacement of the original liquor with a minimum of wash water. Repeated competitive tests on large scale with other types of filters indicate a saving of from 100% to 300% in quantity of wash water used to obtain equally thorough wash. A clean separation of main filtrate and wash solution is automatically made.

USES IN METALLURGICAL PLANTS

Originally developed for the filtration of slime in cyanide plants, the use of the Oliver Continuous Filter has been rapidly extended to the chemical and industrial fields. Scarcely a cyanide plant has been installed in America during the past five years that has not included an Oliver Filter. There are now more Olivers in use in gold and silver mills of the United States, Canada and Mexico than all other types of filters combined.

The worldwide application of the Oliver for dewatering concentrate produced by the Oil Flotation Process in the treatment of copper, zinc, lead, silver, and other ores, is the best proof of its superiority. More than 90% of the filters in use for this work are of the Oliver type.

MATERIALS HANDLED BY OLIVER FILTERS

Ammonium nitrate
Arsenate of iron
Barium carbonate
Blast furnace flue dust
Borax
Calcium carbonate
Calcium sulphate
Calcium tungstate
Calcium phosphate
Calcium sulphite
Caliche
Carbrox
Caustic soda
Cement copper
Cement dust
Cement slurry
China clay
Citric acid
Clay, acid treated
Coal screenings
Copper concentrate
Corn starch
Cyanide slime
Decolorizing carbons
Dinitrophenol
Dyes
Electrolytic zinc slimes
Glucose
Gluten
Gold ore slime
Graphite
Guncotton
Gypsum
Iron concentrates
Iron flue dust
Kaolin
Kelp char
Kelp or sea weed
Lampblack
Lead arsenate
Lead concentrate
Lime cake, first carbonation
Lime sulphur mix.
Lithopone
Lubricating oil
Magnetic iron concentrate
Maltose sludge
Mineral paint
Molybdenite
Nitrate of soda
Norit
Ochre
Oils
Paper pulp
Phenol
Phosphoric acid
Potash from alunite
Potash from flue dust
Potato starch
Potassium bichromate
Potassium carbonate
Saccharate lime—cold
Saccharate lime—hot
Silver ore slime
Slaked carbide
Sodium acetate
Sodium benzene sulphonate
Sodium chloride
Sodium chromate
Sodium hydrate
Sodium nitrate
Sodium permanganate
Sodium sulphate
Sodium sulphide
Sodium hyposulphite
Starch
Strontium carbonate
Talc
Tartaric acid
Tungsten slime
Ulexite
Vanadium precipitates
White lead
Yeast products
Zinc concentrates
Zinc oxide

Continued on Next Page

USES IN CHEMICAL WORKS

In the chemical industry the Oliver finds a wide use in the manufacture of caustic alkalies, phenol, ammonium nitrate, bicarbonate of soda, nitrate of soda, phosphate of potash, paints, dyes, and many other chemical products. Its use has revolutionized filter practise reducing labor, increasing savings and cutting cost of production.

Causticizing

It is particularly adapted to dewatering and washing the mud produced in the causticizing process for the manufacture of caustic soda. The volume of liquor to be handled is greatly reduced, higher concentrations are maintained and more complete extraction of the caustic liquors effected.

Starch and Glucose

In starch plants the Oliver handles starch for producing dry starch and dewaters starch for conversion into glucose; being successfully used for clarifying glucose liquors and for filtering gluten.

Sugar

A most successful use of the Oliver is for the filtration of Saccharate of Lime and First Carbonation Juice in Beet Sugar Factories. During the past four years more than 180 Olivers have been installed for this work. Using but one-third the amount of wash water required by other types, higher cake purities are obtained. Labor for operating and cloth consumption are only a small fraction of that necessary with other filters. In several instances first cost of installation has been repaid in one year by saving in filter cloth alone. Very successful for handling Carbrox, Norit and other decolorizing Carbons used in clarifying sugar juice, glucose, etc.

Wood Pulp

In the washing of paper pulp the recovery of black liquor is increased, uniformly clean sheets are produced, a clean liquor of uniform density is delivered to the evaporators, and evaporator load is decreased over 25%.

Over 100,000 tons of solids per day are being filtered on Olivers in all parts of the world, handling practically every product that can be filtered in plate and frame presses, or any other filter, at one-half to one-tenth the cost—and with higher recoveries. New uses are developed continuously by investigations in new fields.

VACUUM PUMPS AND VACUUM RECEIVERS

Especially designed and constructed for use with Oliver Continuous Filters. Manufactured in our own factory. Highly efficient and recommended for any dry vacuum service. Built with displacements of 50, 75, 200, 400 and 800 cu. ft. per minute.

COMPRESSORS

Our dry vacuum pumps can be used as low pressure compressors without change. Pressures from 20 to 50 lbs., depending upon size of compressor. Displacement 50, 75, 200, 400 and 800 cu. ft. per minute.

CENTRIFUGAL PUMPS

Designed for Oliver Continuous Filter requirements to operate against high vacuums, but are excellent for any service to which centrifugal pumps are adapted. Made in cast iron, acid-proof bronze or special alloys. Sizes, 1½″, 2″, 2½″, 3″ and 4″ in both belt and motor drive.

DRY VACUUM PUMP DESIGNED ESPECIALLY FOR OLIVER SERVICE

Recommended for use on dry vacuum systems requiring high efficiency

ACID PUMPS

Specially constructed acid-proof 2″ centrifugal pump for handling exceedingly corrosive solutions. Suitable for hydrochloric, dilute sulphuric, hydrofluoric, phosphoric acids or other corrosive acids or compounds.

OLIVER-SHERWOOD CUTLESS BEARING

A bearing designed for conditions where water and grit cut the bearing and shaft. Adopted by leading pump manufacturers for bearings on vertical deep well pumps, and inner bearings on centrifugal sand pumps. A bearing that will run in water and grit without any wear on bearing or shaft. No attention or lubrication required. Suitable for log washers, suction dredge shafting, step bearings in agitators, etc.

OLIVER SERVICE

Three laboratories are maintained for the investigation of filtration problems. Tests are made free of charge. Send full particulars of your conditions and a 5-gallon sample of the thickened pulp to our nearest laboratory. Do not dry the sample before shipping, as filtering characteristics may be altered. We assist in planning filter installations and place our data and experience at your disposal. Our files contain a wealth of useful information on filtration problems that will aid in solving your difficulties.

SEND FOR ILLUSTRATED CATALOG 12 D

OLIVER CENTRIFUGAL PUMP, BELT DRIVEN TYPE

Also made for direct connection to motor drive

THE OLDMAN BOILER WORKS, INC.

Manufacturers of Steel Tanks
Boilers and Plate Work of Every Description
Electric and Oxy-acetylene Welding
Main Office and Works
BUFFALO, N. Y.

PRODUCTS

- **Upright Boilers**
- **Tubular Boilers**
- **Marine Scotch Boilers**
- **Dry Back Boilers**
- **Oldman Patent Boilers**
- **Heating Boilers**
- **Steam Jacket Tanks**
- **Mixing Tanks**
- **Receiving Tanks**
- **Storage Tanks of any capacity**
- **Rendering Tanks**
- **Digesters and Dryers**
- **Special Designed Tanks**
- **Guyed and Self-supporting Stacks**
- **Smoke Flues**
- **Breechings**
- **Penstocks**
- **Blast Furnace Work**

It will be to your advantage to consider our prices, deliveries and specifications when in the market for any of the above products.

An organization of thirty years' experience at your service.

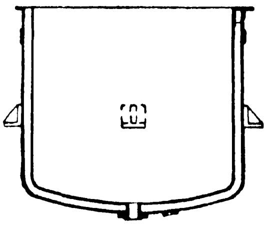
SPECIAL STEEL PLATE CONSTRUCTION

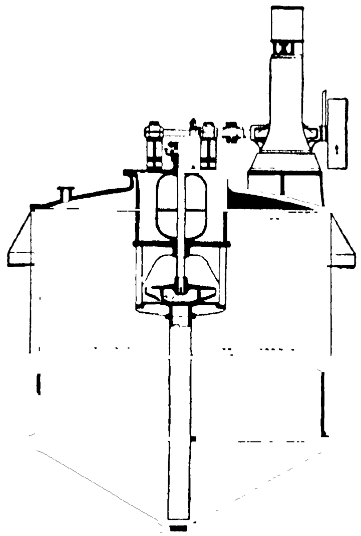
We make a specialty of steel plate construction that is built to the customer's specification. In this connection we have built a large amount of chemical plant equipment, a few examples of which are shown below.

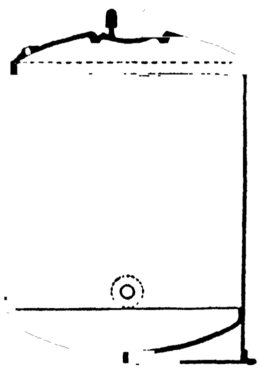
Our engineers having had wide experience in this field, we are often called upon to advise with prospective clients as to the best type of construction to fit certain conditions. This experience is at the service of those firms requiring complete engineering services for design, construction and erection of chemical equipment.

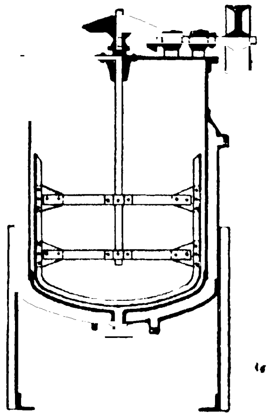
WELDED STEEL PLATE EQUIPMENT

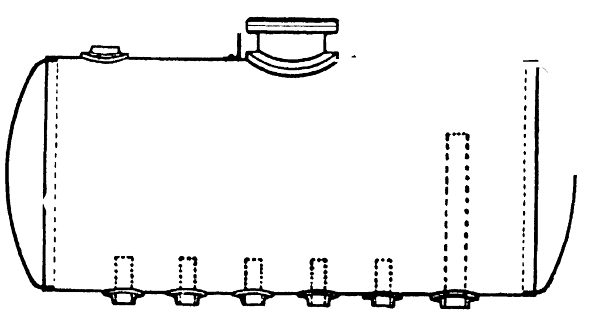
The superiority of welded steel equipment over the riveted for conditions where severe corrosion or high pressures exist, is being fully recognized to-day by operating engineers. Our shops are fully equipped to turn out welded apparatus of any size.


ELECTRIC WELDED STEAM JACKETED TANK


ACID GENERATING TANK


RECEIVING TANK


STEAM JACKETED MIXING TANK


HORIZONTAL RECEIVING TANK

CHARLES ORDWAY

Successor to
THE YARYAN COMPANY
25 CHURCH STREET, NEW YORK, N. Y.

PRODUCTS

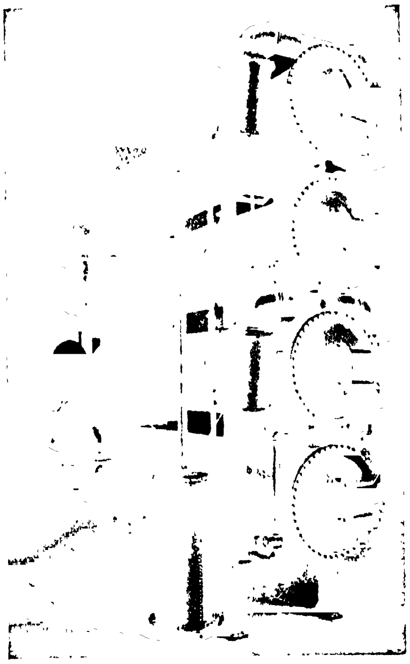
Evaporators, **Single and Multiple Effect; Yaryan** System **Heater, Malone Block Liquor Filter.**

TYPES OF YARYAN EVAPORATORS

Yaryan Horizontal, Yaryan Vertical; Ordway-Yaryan Vertical, Ordway-Yaryan Horizontal, Ordway Yaryan Box.

THE YARYAN SYSTEM

Film evaporation is the distinguishing feature of the Yaryan System, which is accomplished by forcing a very small stream of liquor into a comparatively large steam-heated tube, this tube being one of several composing a continuous coil, thus blowing the entire mass of liquor into spray. The last tube of the coil has an outlet into a chamber that is under a less pressure than that on the feed end, resulting in an increasingly rapid flow of vapor-entrained liquor through the coil toward the separating chamber. The salient features obtained by this system are in addition to Film Evaporation, rapid motion of liquor over heating surface, great gain in absorption of heat by the liquor as its velocity increases, less liability of injury to the liquor, and of incrustation on the heating surface, the use of waste exhaust steam, or steam at high pressure.



THE ORDWAY-YARYAN VERTICAL TYPE

General Construction—Condensers, Pumps and Piping are supplied, best adapted for the system

Heater—The Yaryan System Heater is very successful in preheating liquors to be concentrated It is a counter-current heater, utilizing the heat in the drip from the first effect

Catchalls—Entrainment is the bugbear of evaporator manufacturers, especially in handling valuable or foamy liquors. Our catchalls prevent this

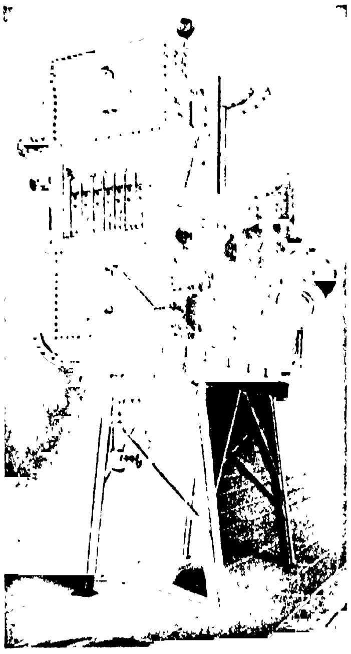
Metal Yaryan evaporators can be built of any desired metal or alloy

The Yaryan System permits of a double or triple effect in concentrating Pectin, Gelatin or other delicate liquids, without affecting color or flavor, thus affording great saving in steam and water over a single effect

A Yaryan effect can be added to any existing evaporator installation resulting in a proportionate saving in steam and water

Above all, this evaporator is successfully used in handling very foamy liquors, such as Soda Pulp Liquor, which is one of the most troublesome solutions known

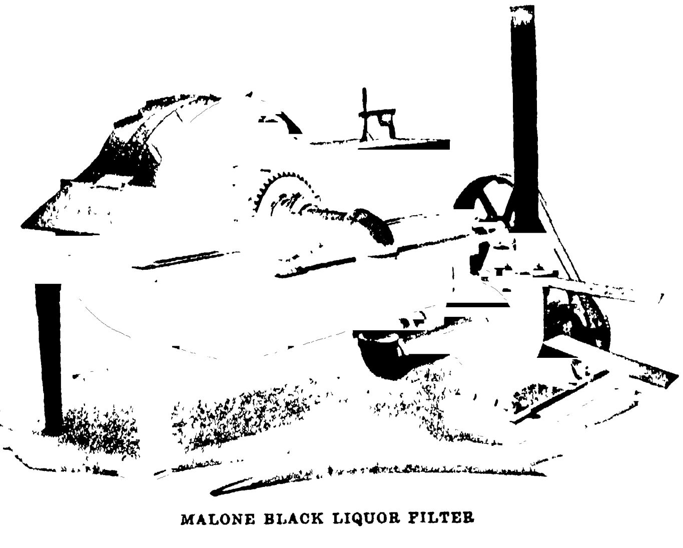
The construction permits of very high steam pressures, as well as low, being used



THE ORDWAY-YARYAN BOX TYPE

MALONE BLACK LIQUOR FILTER

This filter was designed and is in successful operation in many pulp and paper plants for the separation of pulp from the black liquor before evaporation. It is very economical because it saves the evaporator tubes from being coated with pulp, as well as recovering the latter.



MALONE BLACK LIQUOR FILTER

TINIUS OLSEN TESTING MACHINE COMPANY

Manufacturers of Testing Machines, also
Olsen-Carwen Static-Dynamic Balancing Machines

500 NORTH 12TH STREET, PHILADELPHIA, PA.

PRODUCTS

Testing Machinery and Instruments for determining the Physical characteristics of all material. Universal Testing Machines, Special Testing Machines for Hardness, Torsion, Impact, Bending, and Alternate Stress Testing. Special Testing Machines for cement, concrete, fabric, cloth, twine, paper, rubber, leather, oils, grease, bearing metal, and ball or roller bearings. Also testing machines for molded insulating material, springs, wire, rope, chain, anchors, iron, steel, welds and welding material, road materials, etc. Special Efficiency Testing Machines for determining the property of all tools. Special Milling Machines, pumps, Viscosimeters, presses, accumulators, also various types and sizes of Olsen-Carwen Balancing Machines for balancing rotating parts.

OLSEN CATALOGS

We build several hundred types and sizes of testing machines applying to almost every conceivable class of material and have classified these machines, according to their similarity and use in our catalog, by dividing it into eight (8) parts, and various Bulletins as follows:

Part "A"—Universal Testing Machines and Instruments.
Part "B"—Spring Testing Apparatus and Special Machinery.
Part "C"—Cement, Concrete and Road Materials Testing Machinery.
Part "D"—Cloth, Yarn, Paper, Leather and Rubber Testing Machinery.
Part "E"—Wire, Rope, Chain and Anchor Testing Machinery.
Part "F"—Oil, Grease, and Bearing Metal Testing Machinery.
Part "G"—Transverse and Beam Testing Machinery, Foundry Testing Machines.
Part "H"—Special Testing Machinery, including Impact, Abrasion, Vibratory, Bending, Hardness, Endurance, Torsion, Alternate Stress, and Efficiency Testing Machines.
Pamphlet—Olsen-Carwen Static-Dynamic Balancing Machines.
Pamphlet—Theory of balancing and technical description of Olsen-Carwen Balancing Machines.

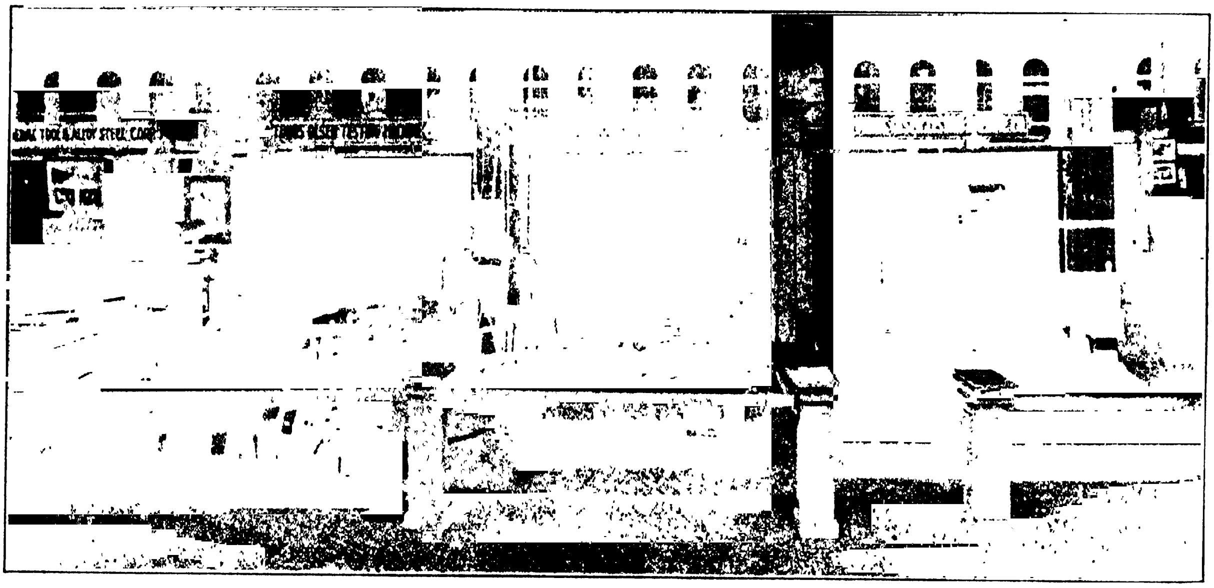


EXHIBIT OF OLSEN TESTING MACHINES, STEEL TREATERS' CONVENTION, PHILADELPHIA, PA., 1920

This exhibit illustrated all the very latest up-to-date testing machines used by Metallurgists and Steel Treaters throughout the country and abroad, and included the following

100,000 lbs capacity "Olsen" Latest Automatic and Autographic Universal Three screw Type Testing Machine
60,000 lbs capacity "Olsen" Automatic and Autographic Torsion Testing Machine, No. 1.
"Upton Lewis" Toughness and Endurance Testing Machine, No. 2
"Olsen Foster" Alternate Torsion Testing Machine, No 2
"Olsen" Combined Impact Tension and Cantilever Type Impact Tester
"Matsumura" Repeated Impact Tester
"Olsen" Special Endurance Testing Machine
"Olsen" Hydraulic Brinell Hardness Tester with Microscope and Depth Measuring Instrument
"Olsen" Autographic Transverse Tester, No 1.
"Olsen" Ductility Testing Machine, No 2.
"Lewis Hayes" Extensometer.

Continued on Next Page

TESTING LABORATORY, RESEARCH DEPARTMENT

ave a completely equipped Testing Laboratory earch Department in which we are prepared all kinds of tests and investigations and de- ew methods of testing and suitable machines purpose

cal problems requiring the development of new of testing and new designs of testing machines are placed in the hands of expert Engineers are trained in this class of work.

GUARANTEE

All testing machines, as built or manufactured by us, are of the most improved design, built of the very best material, and of the highest grade of workmanship. They are thoroughly tested on completion, and satisfaction is guaranteed.

OLSEN-CARWEN STATIC-DYNAMIC BALANCING MACHINES

In this age of high speed machinery it is essential for their successful and continued use that all rotating parts are in perfect balance.

The unbalance in any rotating part is either static or dynamic or both, and it is necessary to determine the exact amount of unbalance statically first, together with the plane or angle of unbalance. This static unbalance is then temporarily corrected on the machine, and the point along the length of the rotor or the particular crank of a crankshaft found at which such a static unbalance should be corrected to prevent the introduction of a dynamic couple.

If a dynamic unbalance is still present, this is then found as to amount and plane or angle and the entire correction for both static and dynamic unbalance made at one and the same time.

The feature of determining the point along the length of the rotor or the crank of the crankshaft at which static unbalance should be corrected is of exceedingly great importance as very often a rotor only has a static unbalance which, if corrected at the wrong point along its length, only introduces a dynamic unbalance, requiring more time and work to eliminate.

The Olsen-Carwen Balancing Machine will balance any rotating part perfectly with speed and economy, thereby placing the art of balancing on a production basis, so each and every crankshaft, fly-wheel, fan and driving shaft of an automobile or truck can readily be balanced, as well as every armature or rotor used in the electrical world.

Olsen-Carwen Static-Dynamic Balancing Machines are made horizontal, as shown, in many sizes, from that of balancing small armatures up to that of balancing the largest of rotors, also special machines for crankshaft balancing, or where a crankshaft has more than two (2) bearings, it is imperative to mount same in three (3) bearings, in the balancing machine for accurate results.

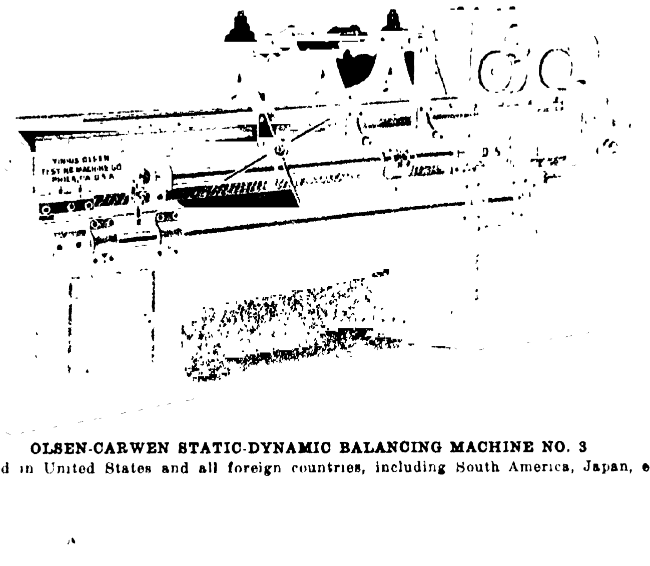
Olsen-Carwen Static-Dynamic Balancing Machines are made vertical for balancing separator bowls, etc., with the liquid contained in them, and also of various sizes.

RESEARCH AND BALANCING DEPARTMENT

We maintain a complete Research and Testing Department with Balancing Machine equipment under the supervision of the very best expert balancing Engineers.

We are thus in a position to balance any rotating parts, crankshafts, rotors or complete engines and make recommendations to you as to design and construction, tending to eliminate vibration and also to design and build special balancing machine equipment based on principles used only in the Olsen-Carwen Balancing Machines and controlled by us.

"Bulletin covering the theory and art of balancing on request"



OLSEN-CARWEN STATIC-DYNAMIC BALANCING MACHINE NO. 3
Patented in United States and all foreign countries, including South America, Japan, etc.

GEORGE F. OTT COMPANY

Established 1870

Coppersmiths, Tankmakers, Machinists

207-213 BUTTONWOOD STREET, PHILADELPHIA, PA.

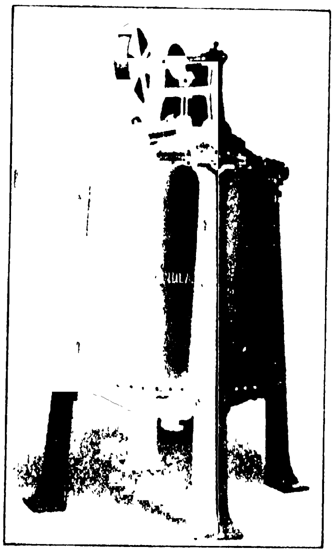
PRODUCTS

Copper, Aluminum, Iron or Steel Equipment for Chemical Plants, Dye Extract Plants, Dye Houses, Tanneries, Breweries, Yeast Plants, Acetic Acid Plants, Including:

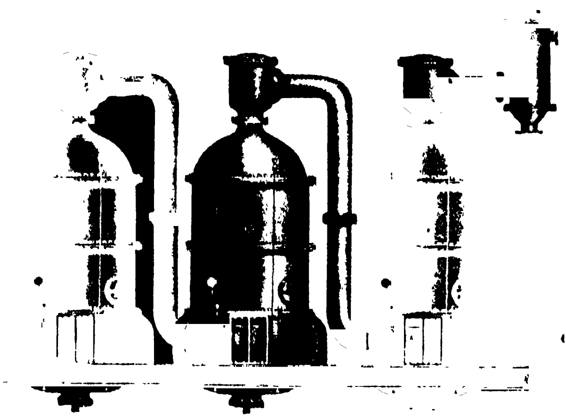
- Autoclaves
- Candy Coating Pans
- Condensers
- Coolers
- Digesters
- Evaporators
- Extractors
- Heaters
- Kettles
- Pipe and Fittings
- Stills
- Stirrers
- Tanks
- Vacuum Pans

FACILITIES

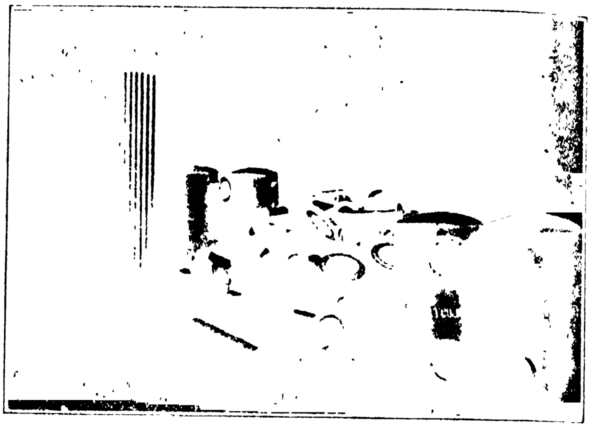
The fact that we operate, in connection with our coppersmith shop, a steel tank department and machine shop, enables us to build to advantage as regards price and delivery, apparatus comprising all three trades. It allows the assembly of complete apparatus, insuring proper fit of all parts prior to shipping.



COPPER STILL WITH HEATING COILS AND STIRRER



COPPER TRIPLE EFFECT EVAPORATOR

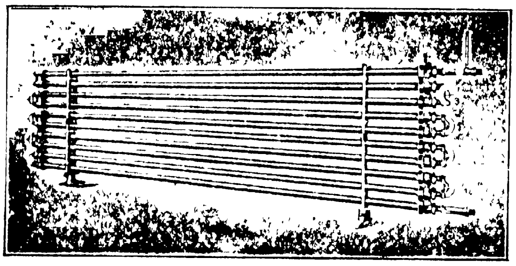


COPPER APPARATUS FOR SOAP-CANDLE AND FATTY ACIDS

EXPERIENCE

To successfully carry out any design, accurate workmanship of its minutest detail is essential.

Our 50 years of experience coupled with our engineering facilities enables us to accomplish this, no matter how complicated the design.



COUNTER CURRENT TYPE DOUBLE PIPE COOLER OR HEAT EXCHANGER

Copper, Copper Lined or Aluminum Tubes, Fittings of any Metals for Heating or Cooling Liquids or Gases

RECORDS AND DRAWINGS

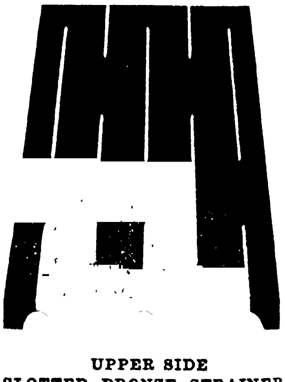
All parts of plants installed by us are accurately tabulated, enabling us to supply any part on short notice.

GUARANTEE

All materials and workmanship carry our guarantee.

ESTIMATES

Upon receipt of rough sketch, drawings or specifications of requirements, we will cheerfully cooperate with you. Please send as much information as is available.



UPPER SIDE
SLOTTED BRONZE STRAINER PLATES FOR ROUND OR SQUARE TANKS

PACIFIC TANK & PIPE COMPANY

"The Standard Since 1888"

Manufacturers - - Contractors
Wood Tanks and Wood Stave Pipe

Main Office: 308 Market St., SAN FRANCISCO, CALIF.

NEW YORK, N. Y.: 506 St. Paul Building
PHILADELPHIA, PA.: 419 Liberty Building
LOS ANGELES, CAL.: 905 Trust and Savings Building
SALT LAKE CITY, UTAH: 327 Newhouse Building
CHICAGO: 171 West Washington Street

PRODUCTS:

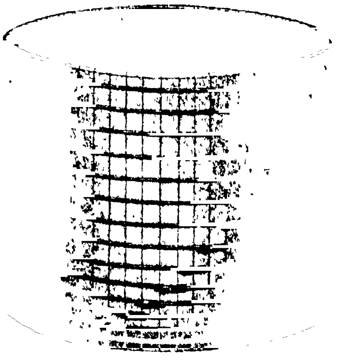
Round, Half Round Oval, and Rectangular Tanks of all capacities, made from California Redwood and Douglas Fir.

Wood and Steel Towers for elevated tanks.

Machine Banded, Continuous Stave, Bored Pipe, and Steam Pipe Casing.

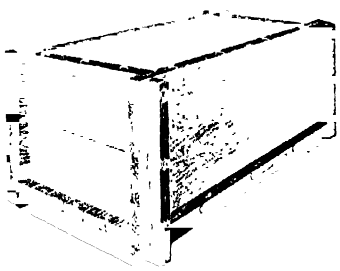
TANKS:

Round tanks of all sizes, fitted with round hoops and malleable iron straight pull lugs—the best container obtainable for chemical solutions.

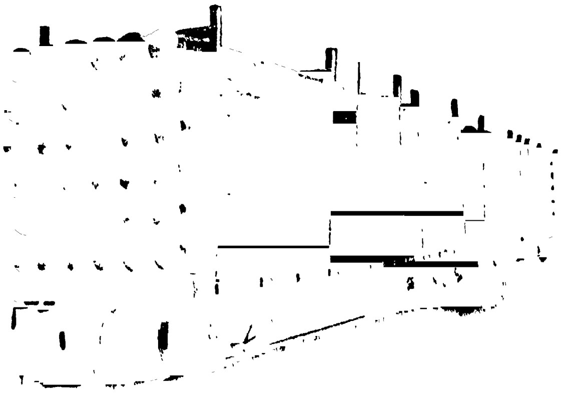


ROUND TANK

Rectangular tanks made to fit unusual requirements. All exposed metal parts on top and inside of tank protected. Made with or without center partitions.



RECTANGULAR TANK

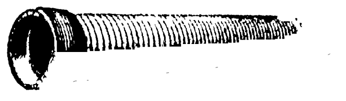


TWO CARS OF PIPE FOR SHIPMENT

PIPE:

Machine Banded Wood Stave Pipe in sizes from 2" to 30". Wound with copper wire for corrosive solutions. Bored Redwood log for acid and brine. Wood covering for steam pipes.

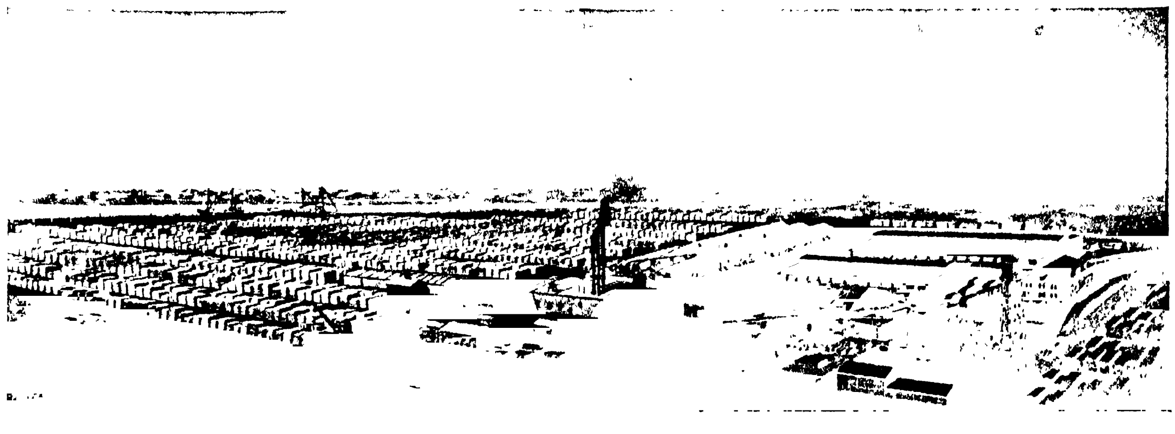
Continuous Stave Pipe for sizes 24" diameter and larger. Suitable for water works systems, mills, and manufacturing plants.



LENGTH OF MACHINE BANDED PIPE

CATALOG:

We will be pleased to furnish our catalog on Tanks, Machine Banded and Continuous Stave Pipe on request.



THE PLANT BEHIND THE GOODS

THE PACIFIC LUMBER COMPANY

(OF ILLINOIS)

Midwestern and Eastern Distributors of California Redwood
2099 McCormick Building
CHICAGO, ILL.

New York, N. Y., 522 Fifth Avenue   Kansas City, Mo. Grand Avenue Temple Building

THE PACIFIC LUMBER COMPANY

Manufacturers and Pacific Coast Distributors
GENERAL OFFICES 311 California Street San Francisco, Cal.   BRANCH OFFICE Central Building, Sixth and Main Streets Los Angel
EXPORT COMPANY A. F. Thane & Company
San Francisco, Cal. 311 California Street   New York, N. Y., 233 Broadway
MILLS Scotia, Humboldt County, Cal.

Manufacturers of Redwood Lumber for Tanks, Vats, Pipe, Etc.

PRODUCT

California Redwood—a non-resinous, soft wood, permeated during growth with an odorless "natural" preservative. Resists acid action, rot and fire.

DISTINCTIVE CHARACTERISTICS OF REDWOOD

Redwood is highly valuable for chemical manufacturing processes because it is unusually resistant to decay, rot and fire, and because of its insulating qualities. Until recent years little was known of the extraordinary values of Redwood as a specialty wood, but as Redwood is becoming better understood by industry its users are increasing continually. Moreover, production and transportation facilities are now available to supply the large demands of the future.

USES

Tanks and Vats
Pipe and Flume
Insulation for all Refrigerating Purposes
Cooling Towers
Factory Roofs
Fire Doors
Fire Walls

REDWOOD TANKS AND VATS

Redwood makes a superior stave for tanks.

Redwood is a non-conductor of heat and cold; 2 in. of Redwood is equivalent in insulating power to approximately 30 in. of steel or concrete. This is an element of high importance in the stave for this use because it preserves the temperature of the contents of the tank.

Redwood staves are made from clear heart straight-grain stock, and come in standard sets of 6 to 9 ft. and 10 to 20 ft. in length.

Redwood's long life and its resistance to decay or corrosive acids and alkalis make it extremely valuable for tanks. Redwood tanks can handle muriatic acid solutions up to 6%, and up to 28% of nitrohydrochloric acid.

Redwood tanks are used in metal mines, where strong solutions of destructive acids are necessary in refining processes; in chemical works, tanneries, breweries, soap factories and other manufacturing processes where the tank is called upon not only to stand up under years of service, but remain unaffected by the contents. There are thousands of Redwood tanks in use for water storage, in wineries, for oil, fire protection, railroads, etc.

Redwood tanks will resist fire, are not injured or affected by arid climates or extremes of temperature. Redwood wears evenly under all sorts of service.

Redwood is particularly adapted to all kinds of tanks, and is used for water tanks, cyanide plant and acid tanks. Following are eight good reasons for using Redwood Tanks

1. They are preserved by water and not rusted or corroded by it.
2. They are not corroded by sulphur or mineral water and fumes.
3. They are not destroyed by reasonably strong solutions of acids or salts.
4. It requires less labor and expense to erect them than metal tanks.
5. They are cheaper than steel or galvanized iron tanks.
6. Their durability exceeds either steel or galvanized iron.
7. They keep water cooler in summer and warmer in winter.
8. They are easily taken down and reassembled at another point, which is not practical in the case of metal tanks.

TESTS OF TIME AND SERVICE

In a large manufacturing plant in New York State, where they refine oil from fats, there are two 3-inch Redwood tanks, one of which was filled with muriatic acid and kept at a temperature of 180° day and night for a period of seven weeks. The same acid remained in the tank three weeks longer, then 9,000 gallons were drawn off, the other 3,000 gallons remaining in the tank indefinitely. Previous to using this tank for acid, it was used for hot water storage. This is about as severe a test as could be put on any wooden tank.

In another large manufacturing plant, a number of 2-inch Redwood tanks have been in continual use since 1907, performing the function of storing fats. At this time these tanks are still giving good service.

In a large tanning factory there are still in use Redwood vats which were installed sixty years ago and which have given continual service since that time. Their present condition is evidence that they will continue to give satisfactory service for an indefinite period.

One of the large metal mining companies states that it is using Redwood tanks both for acid and saline solutions, with the very best results. These tanks are used in a leaching process where the steel hoops must be covered with lead to protect them against the strong solutions.

MACHINE BANDED REDWOOD PIPE

This pipe is made in completed sections, and is shipped, ready to be laid.

The pipe sections are of standard lengths, from 6

Continued on Next Page

24 feet. Diameters are from 2 inches to [illegible]

[illegible] staves are made of carefully selected, well sea-[illegible] Redwood, and milled to the circular outline of [illegible], both inside and outside. They are then as-[illegible] and wound with heavy galvanized pipe wind-[illegible] under heavy tension, the sizes varying accord-[illegible] the pressure.

Laying Redwood machine-banded pipe the sec-[illegible] are simply driven together with a maul or ram.

USES FOR REDWOOD PIPE

[illegible] mines, where drainage water is not only hot, but [illegible] carries mineral and chemical solutions, which are [illegible]mental to other kinds of wood, or to metal.

Conveying water for mining water supply.

Conveying water for fire protection systems.

Irrigation and conveying water on farms.

Conveying mineral and acid water in chemical plants

COMPARATIVE ADVANTAGES OF REDWOOD PIPE

Costs less for material, transportation and installation.

No expansion joints required, as Redwood will not expand nor contract with heat or cold.

Will survive many replacements of metal bands or wire hoops, even though they are heavily galvanized or asphaltic coated.

No "temperature cracks" as in cement or concrete pipe.

Will not freeze under a temperature that will burst metal pipe. If water freezes the flexibility of Redwood will prevent bursting.

No accumulation of blisters or foreign substances to impede flow of water.

Lasts longer than any other pipe except iron.

Not attacked by worms or insect life,—not even by the notorious white ant of tropical countries.

Unusual resistance to acids and alkalis in water or earth.

Water will remain cool, even when pipe is exposed to sun's rays, on account of the non-conductivity of wood.

No discoloration of water contents

No "tainted taste" to water contents.

INSULATING QUALITIES OF REDWOOD IDEAL FOR REQUIREMENTS OF COLD STORAGE PLANTS

Redwood cellular structure when studied under a microscope, looks very similar to a comb of honey between the dark annular rings. Every one of these millions of cells in the growing tree is full of sap, but when the tree is cut into lumber, the lumber must be "seasoned" or dried, before it goes into commercial use. This "seasoning" process consists merely of evaporating the natural moisture of these cells. Each cell, therefore, becomes a dead air space.

The cellular make-up of Redwood is uniform both in the thickness of the cell wall as well as the size of the cell. It is plainly evident, therefore, that heat applied to one side of a piece of Redwood, to travel through the Redwood must pass through a thin cell wall and then another dead air space, and so on. Heat passing through this combination rapidly dissipates.

Prof. L. J. Towne, of Columbia University, gives the relative power of conduction of 1 to 20 between wood and stone, cement or clay products. This means that stone and cement are 20 times a better medium for the conduction of heat or cold than is wood. The millions of dead air cells between the annular rings of Redwood are what give Redwood its insulating power.

INSTALLATIONS OF REDWOOD INSULATION IN COLD STORAGE PLANTS

Manufacturing plants use Redwood as a substitute for corkboard for insulating.

There are some splendid examples of Redwood's insulating power, as well as its remarkable longevity under the most severe service in the old plant of the National Ice & Cold Storage Co., San Francisco. This plant was built in 1902 and Redwood was used throughout. The system of brine casing is incased in Redwood boxes made of 1 in. matched and surfaced Redwood. Nearly all of these insulation boxes are still in use. The temperature in the brine pipes is 6° above zero, and they have gradually built up around the pipe, inside of the box, an incrustation of frost that completely fills the box. In spite of the fact that the temperature of the inside of these insulation boxes is 6° above zero, and the temperature in the engine room of the plant is 80°, there is no shrink, warp, swell, twist nor check in these boxes, nor is there any gathering of frost on the outside of the box which would indicate free conductivity through the wood.

Not only this plant, but most of the icehouses on the Pacific Coast use Redwood as lining for cold storage and ice rooms. In the plant above referred to there are ice storage rooms that have been in continuous use for 15 years, and where Redwood has been incased with frost and ice for that period, and in spite of this severe service these rooms are thoroughly air-tight —the joints of the wood are tight.

REDWOOD FOR ROOFS

Redwood possesses a number of qualities that make it highly preferable for roofs, and particularly in factories where there is humidity and condensation to contend with. It has been found particularly serviceable in connection with the so-called "sawtooth" type of roof.

In many kinds of business such as textile mills, paper mills, etc., where there is humidity or rising steam, there is trouble with condensation that drops back on to the products handled, and creates a manufacturing loss. This is due to the fact that the roofing materials do not properly insulate the sharp differences in temperature between the exterior and interior, and particularly where there is severe cold weather.

It is not necessary to subject Redwood to artificial preservatives to protect it from rot and decay—it possesses a **natural** preservative that resists rot both in contact with water, moisture or humidity, or subjected to variable conditions of heat or dryness, or severe alternating dry and moist conditions. Redwood can be denied ventilation by sealing in metal, and under conditions of this kind it has a high resistance to dry rot; this same resistance to dry rot is present even if the wood is not denied air.

MILLS, FACILITIES AND CAPACITY

The Pacific Lumber Company is the largest manufacturer and distributor of Redwood lumber. Our annual production capacity is now over 125,000,000 ft. of Redwood.

All of our offices are prepared to consult with any lumber user concerning his needs, and to advise as to the suitability of Redwood and its economical use.

If interested in the adaptability of Redwood for your requirements, we shall be glad to give full information and advice without obligation on your part.

PACKARDS & JAMES FISON (THETFORD) LIMITED

Mills-Packard Patented Water-Cooled Sulphuric Acid Chambers

IPSWICH, ENGLAND

AGENT FOR THE UNITED STATES

ANDREW M. FAIRLIE

CITIZENS & SOUTHERN BANK BUILDING, ATLANTA, GA

PRODUCTS

Complete plants for the manufacture of sulphuric acid, using the Mills-Packard patented chambers.

Mills-Packard patented water-cooled sulphuric acid chambers, applied to existing plants.

MILLS-PACKARD SULPHURIC ACID CHAMBERS

The first Mills-Packard chamber was built in England in the year 1914. The merits claimed for this type of acid chamber are now fully established.

More than one hundred Mills-Packard chambers (distributed among twenty-seven different plants) are now operating or are under construction in England, France, Italy, and New Zealand.

These chambers are built in the shape of the frustum of a cone, and are water-cooled on the outside, and are provided with special devices for distributing the cooling water over the lead surfaces.

The advantages of these chambers are:

1. The chamber space required per unit of sulphur burned is reduced to from one-half to one-third the usual space.
2. A very material saving in first cost of plant, per unit of capacity for making acid.
3. A substantial saving in ground-space, per unit of production capacity.
4. Longer life of the lead chambers.
5. No building is required for housing the chambers.
6. Niter consumption, per unit of sulphur made into acid, is no higher than with the ordinary type of chamber.
7. Feasibility of combining one or more Mills-Packard chambers with the rectangular chambers of existing plants, or with tower systems, to increase production capacity at small construction cost.

ACTUAL OPERATING RESULTS

Chamber space required 3.5 to 4.5 cu. ft. per po of sulphur burned per 24 hours.

Niter consumption 3.0 to 4.0 per cent., based on sulphur burned.

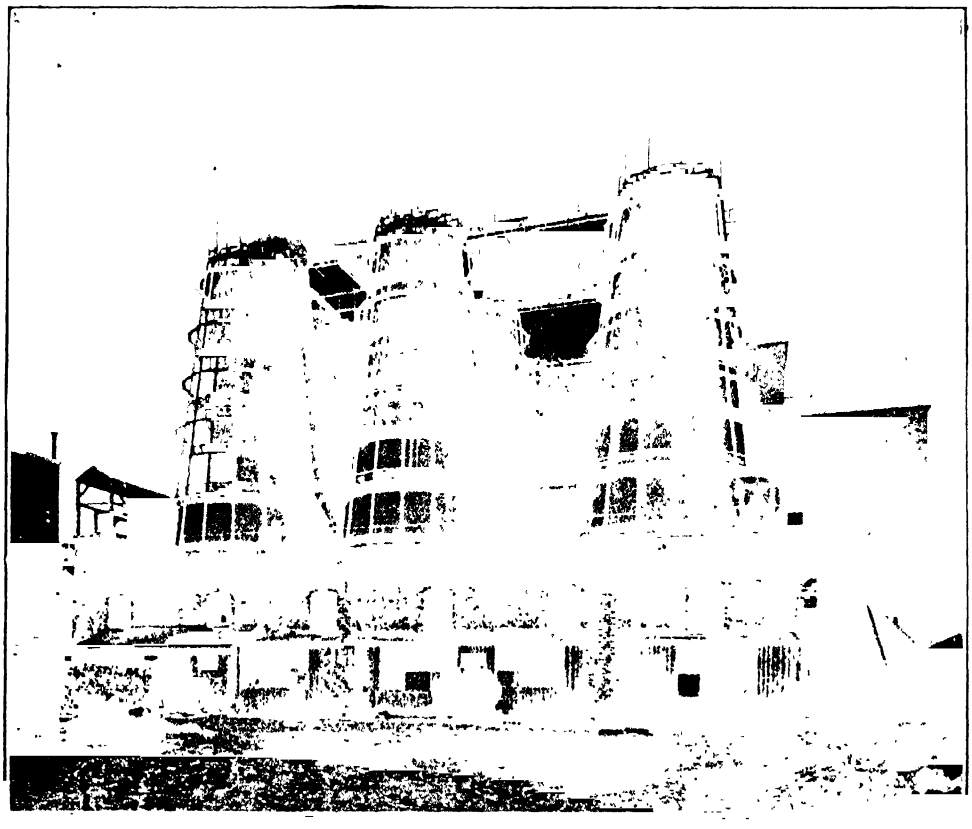
Cooling water required: 250 gallons per chamber per hour for the small chambers (7,330 cu. ft. each), 50 gallons per chamber per hour for the large chamb (11,890 cu. ft. each).

SERVICES

The authorized agent for the United States is prepared to design and erect complete sulphuric acid plants, incorporating the Mills-Packard patented chambers, or to erect Mills-Packard chambers as an adjunct to existing plant, and to issue licenses for their use.

Inquiries from American manufacturers invited. References to operators of the Mills-Packard chambers furnished on request by

ANDREW M. FAIRLIE, Chemical Engineer,
Citizens & Southern Bank Building, Atlanta, Ga.



INSTALLATION OF NINE MILLS-PACKARD PATENTED WATER-COOLED SULPHURIC ACID CHAMBERS

PALO COMPANY

153-157 WEST 23RD STREET, NEW YORK, N. Y.

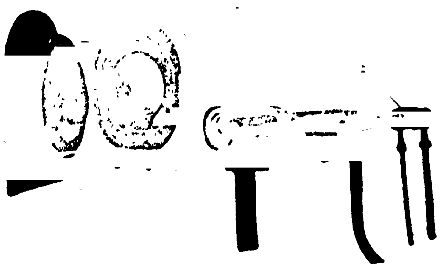
SOLE AGENTS FOR

G. Meker & Cie, Paris L. Durieux & Cie Paris Hess Ives Tint Photometer Goerz Polariscopes

PRODUCTS

Apparatus for Laboratory and Industrial Use.

MEKER BURNERS AND FURNACES

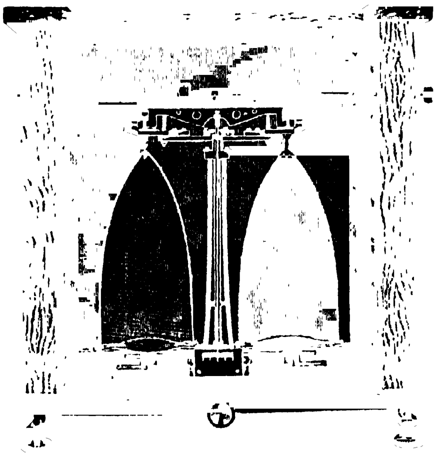


MEKER FURNACE

The enviable reputation of genuine imported Meker products enables us to unhesitatingly recommend Meker burners and furnaces for both laboratory and industrial purposes. Meker muffle furnaces attain temperatures ranging from 750°C. to 1650°C., whereas the crucible furnace produces temperatures in the crucible from 1050°C. to 1750°C.

Write for Descriptive Catalog.

IDEAL ANALYTICAL BALANCE



IDEAL ANALYTICAL BALANCE

This balance has a capacity of 200 grams and is sensitive to 1/10 of a milligram. The beams, stirrups, and pans are released in one operation.

Complete with set of weights, $57.00. Complete information on this and other balances sent on request.

HESS-IVES TINT PHOTOMETER

HESS-IVES TINT PHOTOMETER

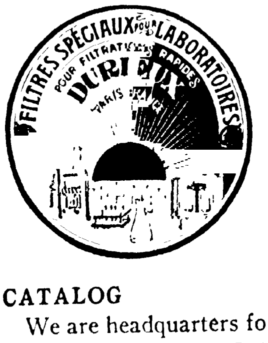
The Hess-Ives tint photometer is for measuring and matching colors. It is based on entirely scientific principles and accurately measures color values of both liquids and solids numerically. This measurement is a definite determination of the amount of each of the primary colors and of black and white which enters into the composition of the color to be measured.

The photometer is recommended for use with:

Celluloid
Chemicals
Clays
Dental Products
Dyes
Flour
Glass
Glue
Ink
Lacquer
Lard
Oils
Oil Cloth
Paint
Paper
Pigments
Rubber
Silk
Soap
Sugar
Syrup
Textiles
Varnish, Etc.

Complete description will be sent on request.

DURIEUX FILTER PAPER



There is a grade of this paper to meet every requirement both in the laboratory and the plant. We are prepared to give you assistance in selecting the most efficient and economical quality.

Price list and samples sent on request.

CATALOG

We are headquarters for Refractometers (all kinds), Spectroscopes, Water Stills, Polariscopes and Accessories, Calorimeters, Microscopes, etc.

Our general catalog will be sent on request.

PARKS-CRAMER COMPANY

Piping Engineers and Contractors

1102 OLD SOUTH BUILDING, BOSTON, 9, MASS., U. S. A

Fitchburg, Mass. Charlotte, N. C.

PRODUCTS

- Merrill Process High Temperature Industrial Heating Equipment
- Humidifying and Air Conditioning Equipment
- Industrial Piping

THREE ABSORBERS SUPPLYING HEAT TO FOURTEEN JACKETED KETTLES IN A LARGE CHEMICAL MANUFACTURING PLANT

MERRILL PROCESS OF INDUSTRIAL HEATING BY OIL CIRCULATION

In the Merrill Process of Industrial Heating a specially selected mineral oil is used as a medium for transmitting heat. This fluid is mechanically circulated at a high velocity by means of a Positive Rotary Pump through a specially designed Absorber or Oil Heater, thence through supply mains to the Apparatus to be heated, which apparatus may consist of Jacketed Kettles, Tanks or Pipe Coils through which a continuous flow may be maintained From this apparatus the oil is forced back through return mains to the pump which keeps it in continual circulation. An expansion Tank is provided to take care of the increased volume of the oil as its temperature rises. The only pressure on the system, outside of the static head, is that necessary to overcome friction and will not usually exceed fifteen pounds at the Apparatus heated.

When the system is in operation the Circulating Oil is going through a continuous cycle of cooling and reheating. At the point where the heat is utilized the temperature of the Circulating Oil drops as it passes through the Jacketed Vessel, Pipe Coil or whatever the apparatus may be. In the Absorber the Circulating Oil is reheated to the same temperature as before and is therefore ready to repeat the cycle.

This heating medium may be circulated at a temperature as high as 600°F. (316°C.) without any change in its physical or chemical characteristics, consequently this system makes an ideal method of heating where materials have to be raised to temperatures ranging from 300°F. (149°C.) to 550°F. (288°C.), allowing ample temperature difference for a rapid rate of heat transfer.

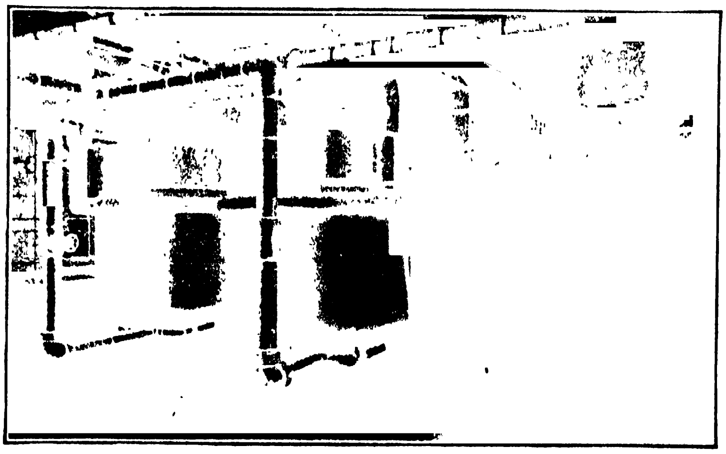
This system fills the most exacting requirements for temperature regulation and control, a feature of great importance in the Chemical Industry.

As the Absorber or Oil Heater, which is the only point in the system at which there is any flame or incandescent surface, may be located at any reasonable distance from the apparatus heated, the fire hazard may be reduced to a minimum.

As the furnace design may be arranged to suit the kind of fuel used, a comparatively high furnace efficiency may be maintained in utilizing the heat energy in the fuel.

This equipment is made up in standard size units and complete estimates will be furnished on request.

Send for descriptive booklet.



SIX GLASS LINED JACKETED TANKS HEATED BY A MERRILL PROCESS SYSTEM WITH OIL CIRCULATION

PENNSYLVANIA CRUSHER CO.

New York Pittsburgh

STEPHEN GIRARD BUILDING, PHILADELPHIA

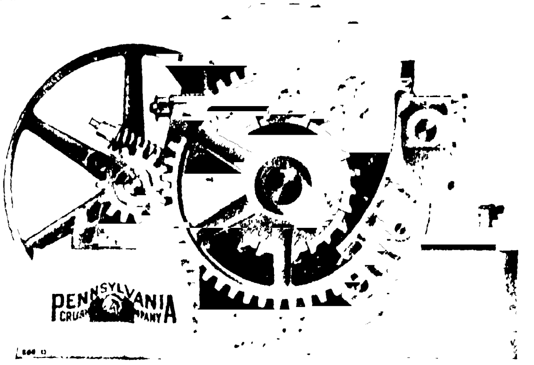
PRODUCTS

"Pennsylvania"
- Single Roll Crushers
- Hammer Crushers
- Bradford Coal Breakers and Cleaners
- Double Roll Crushers
- Grinding Pans, Wet and Dry Types
- Jaw and Rotary Crushers
- Feeders and Chutes
- Special Crushing Machinery

SERVICE

The measure of value in crushing machinery is service, which in turn predicates a simple, sturdy design, refined by experience, and intelligent observation "Pennsylvania" equipment is built on these ideals for dependable, efficient service rather than low first cost

"PENNSYLVANIA" SINGLE ROLL CRUSHERS



CROSS SECTION "PENNSYLVANIA" SINGLE ROLL CRUSHER, SHOWING CONSTRUCTION AND METHOD OF OPERATION. (PATENTS PENDING)

"Pennsylvania" Single Roll Crushers, in three distinct series, have been specialized for preparing bituminous coal for stokers—Bulletins 1001 and 501A — Primary and secondary crushing of cement rock, limestone, gypsum and similar materials—Bulletin 1002 — Crushing burnt lime, caustic soda, clay, phosphate rock, soft ores and various chemicals—Bulletin 1003

Each type in dimensions and weight is liberally proportioned for its service.

Capacities range from 10 to 450 tons per hour.

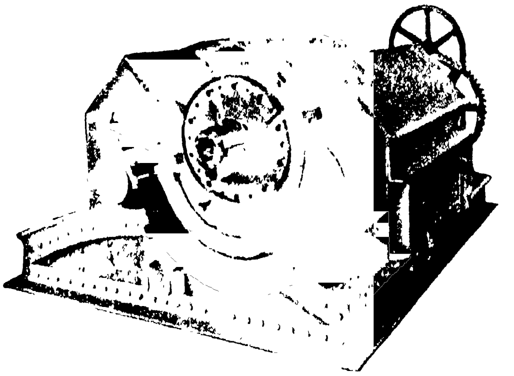
Operation—In operation the material entering the Crusher from grab bucket, track hopper or feeder, is drawn between the toothed roll and the breaker plate, where through an extended zone of crushing action, it is reduced with relative uniformity to the desired size in one operation, with minimum fines, slabs and oversize.

Design The massive frame, heavily ribbed and reenforced with steel tie rods, carries a heavy crushing roll and an adjustably hung spring-controlled Breaker Plate A steel shear pin device provides double tramp iron protection

"PENNSYLVANIA" HAMMER CRUSHERS AND PULVERIZERS

"Pennsylvania" Hammer Crusher and Pulverizers are built in several series, each specialized for a distinct service, as follows:—

"Thor" Type—11 sizes for fine crushing of chemicals, ores, sinters, cement rock, burnt lime and agricultural limestone Bulletin 1010



PHANTOM DRAWING SHOWING CONSTRUCTION AND FUNCTIONING OF "PENNSYLVANIA" HAMMER CRUSHER

"Super" Type 4 sizes, for primary heavy duty crushing on cement rock, limestone, gypsum, the softer ores, and similar materials Bulletin 1005

"SX" Type 15 sizes, for the fine crushing of bituminous coal in By Product, and Beehive Coke Plants and Coal Washeries Bulletin 1004

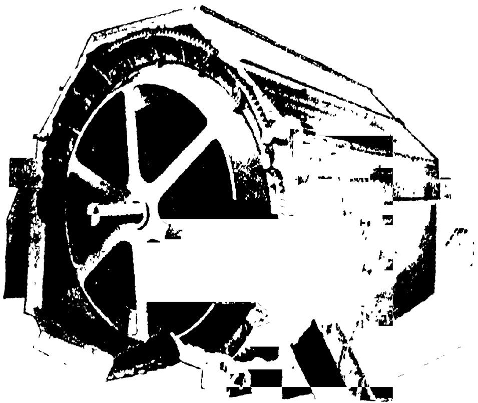
"W" Type 4 sizes, for crushing Anthracite Bore Hole Debris and similar service Bulletin 1012

"Pennsylvania" Hammer Crushers have powerful fabricated steel frames, heavy all-steel rotors and massive specially designed bearings

The "Pennsylvania" non-magnetic Tramp Iron Separator is optional equipment with all types

Capacities range from 5 to 400 tons per hour.

"PENNSYLVANIA" BRADFORD COAL BREAKERS AND CLEANERS



DRAWING SHOWING CONSTRUCTION, CRUSHING AND CLEANING ACTION OF "PENNSYLVANIA" BRADFORD COAL BREAKER AND CLEANER

"Pennsylvania" Bradford Coal Breakers and Cleaners are used in By-Product Coke Plants, Mines, Coal Washeries and Central Stations for the preliminary crushing and automatic cleaning of bituminous coal.

The cost of crushing is lower per ton than with any other form of crusher, with the added advantage that a large percentage of the harder refuse is automatically rejected. The construction and uses are described in Bulletins 1006, 1006A, 1006B, 1006C, 1006D.

THE PATTERSON FOUNDRY & MACHINE CO.

Builders of Chemical Machinery

EAST LIVERPOOL, OHIO

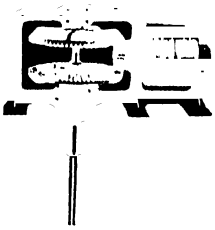
PRODUCTS

- Agitators and Stirrers
- Ball, Pebble and Tube Mills
- Crushers, Disintegrators and Grinding Pans
- Dry, Liquid and Paste Mixers
- Evaporating Pans
- Filter Presses
- Pumps
- Screens and Sifters
- Special Chemical Machinery
- Tanks of Wood or Steel
- Wire Cloth

AGITATORS

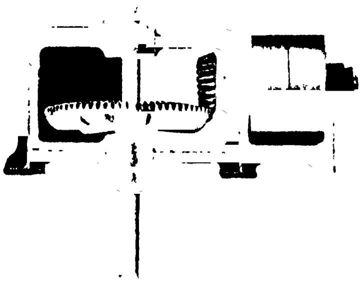
Patterson agitators on account of their adaptability to any kind of tank, kettle, cistern, vat, barrel, stoneware jar, or other container fill a long felt want Because they are a stock machine, obtainable in quantity and in a number of designs and sizes, either from stock or on short notice, they have become an accepted standard in many industries

Extensively used by chemical, aniline dye, paint and varnish, cement, ink, glue, grape juice, fruit juice and food manufacturers; sugar refiners; clay and earthenware plants, cloth printing plants; powder, steel, textile and rope mills, in fact in any plant where liquids and pastes are mixed or stirred.



DUPLEX AGITATOR

Stirrers revolve in opposite directions Built in same size as single agitator



SINGLE AGITATOR

Built in three sizes

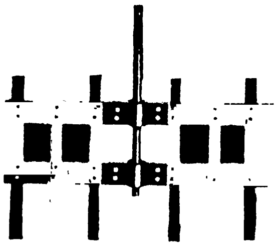
Regular for tanks from four feet diameter to 12 feet in diameter

Miniature for tanks from 3 feet to 4 feet diameter

Midget for tanks 2 feet diameter and smaller

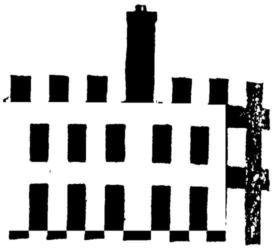
STYLE "A" STIRRER

Two 6" x ¼" bars of open hearth steel Also furnished ("A-1") cast iron blades.



STYLE "B" STIRRER

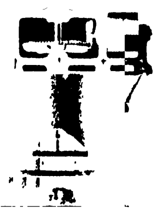
Two sets of 2" x 4" oak cross arms bolted to cast iron arms set screwed to shaft Six 2" x 4" oak teeth bolted to cross arms



ACIDPROOF STIRRER

Steel shaft encased in 6" square oak shaft 2" x 4" oak arms run through oak shaft Teeth (2" x 4") dowelled to arms. Wood other than oak supplied when ordered

MIXERS



TYPE "E" MIXER

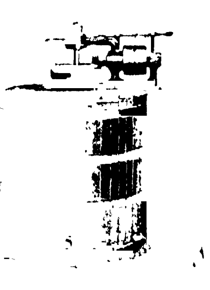
Type E—These mixers are substantially built throughout Made in both plain and jacketed types Regularly furnished with tight steel tank, but can be supplied of acidproof construction with wood tank and stirrer, also cast iron tank and stirrer when desired

DATA

No	Diam of Tank	Depth of Tank	Capacity Gallons	Thickness of Tank	Size of Shaft	Size of Pulleys	Weight lbs	
							Plain	Jacketed
0	15 in	15 in	11	20 Gal	¾ in	4x1½ plain	50 lbs	
1	24 in	24 in	47	16 Gal	1 in	6x2 T&L	150 lbs	650 lbs
2	36 in	36 in	155	⅛ in	1½ in	8x3½ T&L	650 lbs	1250 lbs
3	48 in	48 in	375	3-16 in	2½ in	14x5 T&L	1450 lbs	2500 lbs
4	60 in	60 in	734	¼ in	2½ in	14x5 T&L	2100 lbs	4200 lbs
5	72 in	72 in	1269	¼ in	2½ in	14x5 T&L	2450 lbs	5700 lbs

The Nos "0" and "1" Mixers have cast iron stirrers while the larger sizes are fitted with steel stirrers A suitable draw-off cock is supplied on all mixers for drawing off the contents Tight and loose pulleys are supplied on all except the No "0"

Patterson Mixers are also built in jacketed type suitable for 100 lbs steam pressure



SHELLAC MIXER

300 gals capacity.

8" x 3½" T&L pulleys

Requires 2 h p Floor space 3'8" x 4'0"

Shellac Mixer—The Patterson Shellac Mixer or Cutter is so designed that the shellac is thoroughly cut or mixed in a minimum length of time and with the least evaporation of the solvent

This mixer consists of a well seasoned oak tank 3 ft by 3 ft. with 2 in staves, with 4 substantial hoops Equipped with a Patterson agitator with bronze vertical shaft with bronze hub on lower end to which is fastened the oak stirrer arms. A bronze gate valve is provided to draw off contents

Uses—Patterson Mixers are extensively used for mixing:

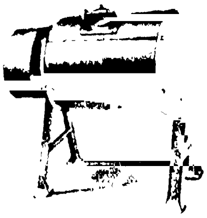
Varnish
Shellac
Glue
Mucilage
Paste
Inks
Clay
Oils
Dyes
Drugs
Earth
Minerals
Greases
Chemicals
Candies
Syrups
Soap
Colors
Juices
Lubricants

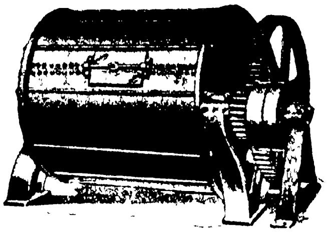
and many other mixed compounds not listed.

Continued on Next Page

PEBBLE AND TUBE MILLS

These mills are of great weight and strength. Where [illegible] strains are to be overcome, charcoal, iron or [illegible] castings are used and the design is such as to give the maximum efficiency with minimum operating [illegible] and cost of repairs





TYPE "E" PEBBLE MILL

Complete with stands
This type not geared

Size	Capacity	H P
12" x 19"	35 lbs	1
18" x 25"	85 "	1½
24" x 36"	150 "	2
30" x 42"	300 "	3
36" x 48"	500 "	4
48" x 60"	1000 "	6

TYPE "B" PEBBLE MILL

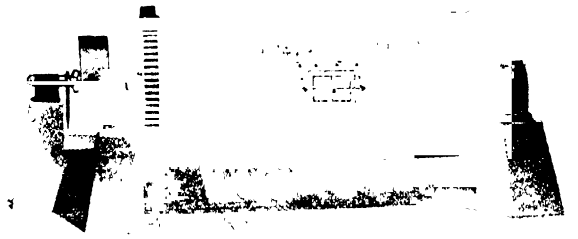
Complete with stands
This type geared

Size	Capacity	H P
2'6" x 3'6"	300 lbs.	3
3'0" x 4'0"	500 "	4
4'0" x 5'0"	1000 "	6
5'0" x 4'0"	1500 "	10

HEAVY DUTY PEBBLE MILL

Fitted with chain oiling engine type bearings

Size	Capacity	H P
6' x 5'	2800	12
6' x 8'	4000	15
6' x 10'	6000	20
7'6" x 5'	4000	18
7'6" x 8'	6000	20
7'6" x 10'	8000	25



PATTERSON CONTINUOUS FEED AND DISCHARGE TUBE MILL

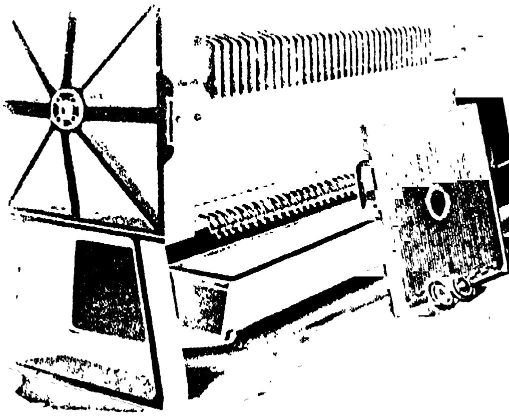
Supplied with or without feeder

Size	Weight	Pebbles	Speed	H P
4' x 10'	15,000 lbs	7,000 lbs	30 R p m	12
4' x 12'	20,000 "	8,500 "	30 R p m	16
4' x 16'	27,000 "	11 000 "	30 R p m	24
4'6" x 16'	30,000 "	13,000 "	28 R p m	30
4'6" x 20'	38,000 "	16 000 "	28 R p m	40
4'6" x 24'	45,000 "	19,500 "	28 R p m	50
5' x 20'	40,000 "	19,000 "	25 R p m	60
5' x 22'	45,000 "	21,000 "	25 R p m	70
5' x 24'	50,000 "	23,000 "	25 R p m.	80
5' x 28'	60,000 "	27,000 "	25 R p m	100
6' x 20'	53,000 "	23,000 "	21 R p m.	90
6' x 24'	60,000 "	28,000 "	21 R p m.	110
6' x 30'	70,000 "	34,000 "	21 R.p m.	140

FILTER PRESSES

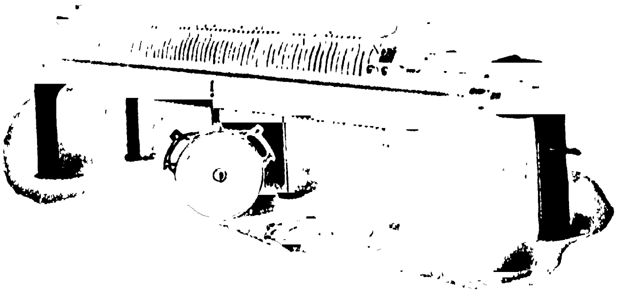
These presses represent the simplest process of separating liquids from solid matter in an economical manner Built with either round or square plates

Square Plate Presses- Made in 18", 24", 30" and 36" sizes, center and corner feed, plain and washing, either recessed plate or plate and frame types Regularly equipped with standard closing device, but can be furnished with hydraulic ram for closing



SQUARE PLATE FILTER PRESS

Round Plate Presses Made in 10", 16" and 27" sizes, center feed, either recessed plate or plate and frame types



ROUND PLATE FILTER PRESS

DATA PATTERSON FILTER PRESSES

Square plate				Round plate			
Size	No chbrs	Sq ft filtering area	Cu cap 1-in cake	Size	No chbrs	Sq ft filtering area	Cu cap 1 in cake
18	18	70	2.92	28"	72	202	20.5
	12	47	1.95	28"	60	168.5	17
	24	94	3.89	28"	48	134.75	13.5
	30	117	4.87	28"	36	101	10
24	24	169	7.03	28"	24	67.5	6.75
	30	211	8.79				
	36	253	10.25				
	42	295	12.30				
30	24	252	10.50				
	30	315	13.12				
	36	378	15.74				
	48	504	20.98				
36	36	561	23.36				
	42	654	27.26				
	48	748	31.15				
	54	841	35.04				

SPECIAL CHEMICAL EQUIPMENT

We are prepared to build special agitators, crushers, grinders, mills, mixers, and filter presses to meet any requirements that can not be fulfilled with our regular stock pattern machines.

PENNSYLVANIA PUMP & COMPRESSOR COMPANY

Manufacturers of Air Compressors, Centrifugal Pumps, Vacuum Pumps

GENERAL OFFICES AND WORKS: EASTON, PA.

New York
Philadelphia
Pittsburgh
Chicago
Minneapolis
Omaha
Birmingham
Richmond
Cleveland
Milwaukee
Salt Lake City
St Louis
Detroit
Columbus
New Orleans
Wilkes Barre
Allentown
Baltimore
Montreal
Vancouver

PRODUCTS

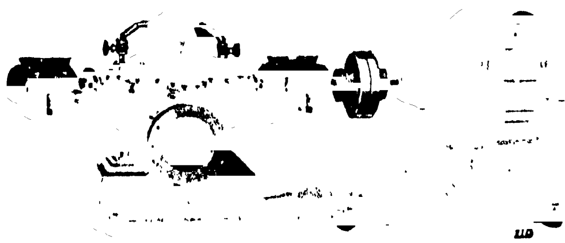
Manufacturers of Steam and Power Driven Air Compressors and Vacuum Pumps, and of Multi-Stage Centrifugal Pumps.

PENNSYLVANIA DOUBLE SUCTION SINGLE STAGE PUMPS

The Pennsylvania is a product from which frailties of design and manufacture have been eliminated. It is a pump of superior design and is carefully built.

Features—Horizontal split casing; Double wearing rings held in place entirely without pins, dowels, etc, self-aligning bearings, unusual accessibility and careful workmanship.

Built in sizes to handle up to 12,000 gals per min, for heads to 250 feet, and arranged for any drive.



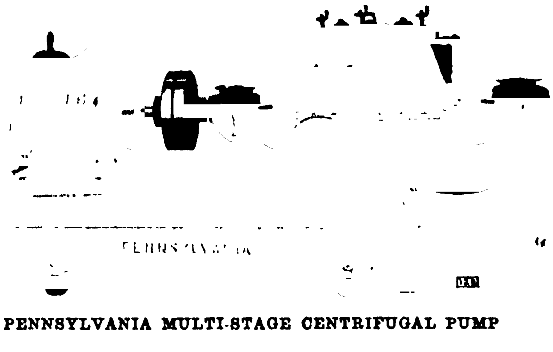
PENNSYLVANIA SINGLE STAGE PUMP

PENNSYLVANIA MULTI-STAGE CENTRIFUGAL PUMPS

These pumps are built in the single-suction type in two, three, four or five stages in one casing of the horizontally split type, and in capacities from 100 to 3000 G.P.M. to suit the speeds of the various prime movers such as motor, turbine or belt.

Their design is a decided departure in certain features from the practise followed by all other centrifugal pump manufacturers. These features include exclusive Pennsylvania design (patents pending) and result in a pump that is trouble-proof and reliable in operation.

Construction—Pennsylvania construction positively eliminates unbalanced forces in the pump. This is done by carrying the leakage water passing through the sealing ring on the discharge side of impeller, through a connecting passage to the suction side of the same impeller. This connecting passage or balancing port is of sufficiently large area to accommodate a much greater leakage than is normally required. It is ample to insure hydraulic equilibrium even after excessive wear has occurred in the sealing rings



PENNSYLVANIA MULTI-STAGE CENTRIFUGAL PUMP

VACUUM PUMPS

These pumps are essentially of the same design as the air compressors, except that the cylinders are proportioned for low pressure work. The inlet valves of this vacuum pump are at the top, and the discharge valves at the bottom of the cylinders. Force feed cylinder lubrication is standard on all our vacuum machines.

VACUUM PUMPS

Class 7-A Power Driven — Class 8-A Steam Driven

Cylinder Sizes	R P M	Piston Disp	B H P Required			Cylinder Sizes	R P M	Piston Displacement	Steam H P Required		
			As Vacuum Pump		As Compressor				As Vac Pump		As Air Comp
			At 28" Vac	At Peak Load 16"-20" Vac	3 Lbs Disch				At 28" Vac	At Peak Load 16"-20" Vac	3 Lbs Disch
14x 5	350	311	4	13	9	18x 6x 6	325	572	8	24	16
18x 6	325	572	8	24	16	22x 8x 8	300	1052	14	43	[illegible]
22x 8	300	1052	14	43	29	24x 9x 9	275	1290	17	52	[illegible]
24x 9	275	1290	17	52	35	28x10x10	250	1776	22	71	46
28x10	250	1776	22	71	46	32x12x12	225	2502	35	100	[illegible]
32x12	225	2502	35	100	63						

AIR COMPRESSORS

Pennsylvania Air Compressors are of the straight line, center crank type. Power driven units can be had of either long or short belt drive from electric motor, line shaft or engine. Steam machines are built with a piston valve steam cylinder interposed between main frame and air cylinder.

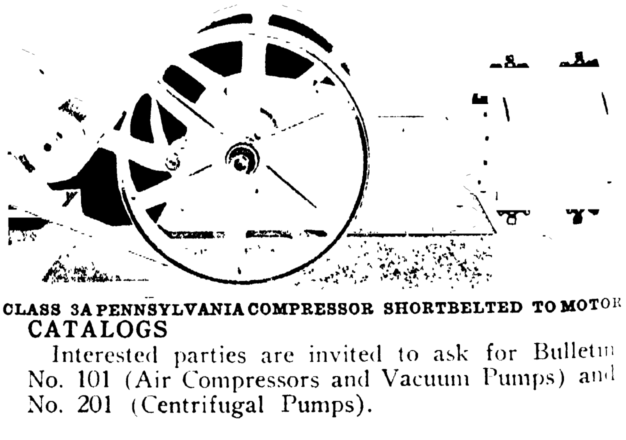
Features—A leak proof continuous lubrication system (with sight oil gauge), taper fitted fly-wheels, forged steel crankshaft and connecting rod (closed end type) and Pennsylvania Ring Plate Valves. The inlet and discharge air valves and all their parts are interchangeable. Box type crosshead works in bored guides. Main bearings are renewable bronze bushings.

Pennsylvania Compressors are guaranteed against breakage in normal service for a period of one year.

Class 4A Steam Driven Machines are built in capacities from 67 to 875 cu ft per minute.

CLASS 3-A POWER DRIVEN AIR COMPRESSORS

Size of Cylinder Ins	R P M	Cu ft free air per minute	Air Pressure		B H P.		Size of Cylinder Ins	R P M	Cu ft free air per minute	Air Pressure		B H P	
			Min	Max	Min	Max				Min	Max	Min	Max
5x 5	400	44	75	125	5½	6	10x 9	300	240	50	100	30	40
6x 5	400	65	50	100	7½	9	12x 9	300	348	25	50	31	41
7x 5	400	88	25	50	8½	10½	14x 9	300	477	10	25	31	43
6x 6	350	67	75	125	9½	10	10x10	275	244	75	125	37	48
7x 6	350	92	50	100	11½	13½	12x10	275	353	50	100	45	61
8x 6	350	120	25	50	12	15	14x10	275	485	25	60	43	66
9x 6	350	153	10	25	12	15	16x10	275	632	15	35	44	67
8x 8	325	148	75	125	22	26	12x12	250	385	75	125	60	77
9x 8	325	188	50	100	23	30	14x12	250	525	50	100	65	87
10x 8	325	233	30	50	23	29	16x12	250	690	25	60	50	96
12x 8	325	336	20	30	29	34	18x12	250	875	15	35	55	92
9x 9	300	195	75	125	29	35							



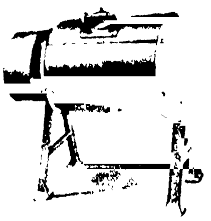
CLASS 3A PENNSYLVANIA COMPRESSOR SHORTBELTED TO MOTOR

CATALOGS

Interested parties are invited to ask for Bulletin No. 101 (Air Compressors and Vacuum Pumps) and No. 201 (Centrifugal Pumps).

PEBBLE AND TUBE MILLS

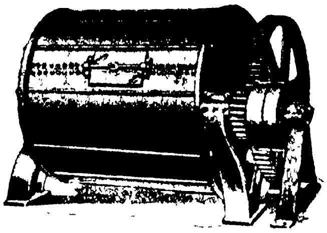
These mills are of great weight and strength. Where heavy strains are to be overcome, charcoal, iron or steel castings are used and the design is such as to give the maximum efficiency with minimum operating expense and cost of repairs



TYPE "E" PEBBLE MILL

Complete with stands
This type not geared

Size	Capacity	H P
12" x 19"	35 lbs	1
18" x 25"	85 "	1½
24" x 36"	150 "	2
30" x 42"	300 "	3
36" x 48"	500 "	4
48" x 60"	1000 "	6



TYPE "B" PEBBLE MILL

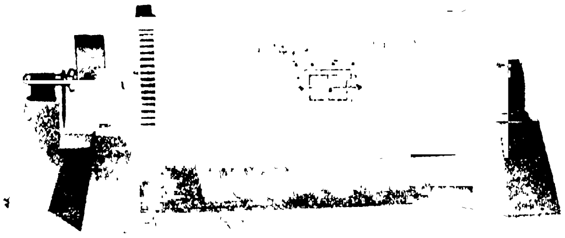
Complete with stands
This type geared

Size	Capacity	H P
2'6" x 3'6"	300 lbs.	3
3'0" x 4'0"	500 "	4
4'0" x 5'0"	1000 "	6
5'0" x 4'0"	1500 "	10

HEAVY DUTY PEBBLE MILL

Fitted with chain oiling engine type bearings

Size	Capacity	H P
6' x 5'	2800	12
6' x 8'	4000	15
6' x 10'	6000	20
7'6" x 5'	4000	18
7'6" x 8'	6000	20
7'6" x 10'	8000	25



PATTERSON CONTINUOUS FEED AND DISCHARGE TUBE MILL

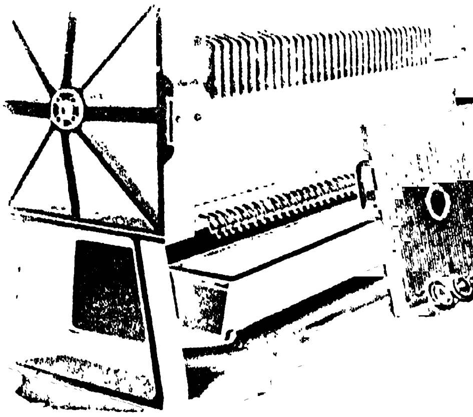
Supplied with or without feeder

Size	Weight	Pebbles	Speed	H P
4' x 10'	15,000 lbs	7,000 lbs	30 R p m	12
4' x 12'	20,000 "	8,500 "	30 R p m	16
4' x 16'	27,000 "	11 000 "	30 R p m	24
4'6" x 16'	30,000 "	13,000 "	28 R p m	30
4'6" x 20'	38,000 "	16 000 "	28 R p m	40
4'6" x 24'	45,000 "	19,500 "	28 R p m	50
5' x 20'	40,000 "	19,000 "	25 R p m	60
5' x 22'	45,000 "	21,000 "	25 R p m	70
5' x 24'	50,000 "	23,000 "	25 R p m.	80
5' x 28'	60,000 "	27,000 "	25 R p m	100
6' x 20'	53,000 "	23,000 "	21 R p m.	90
6' x 24'	60,000 "	28,000 "	21 R p m.	110
6' x 30'	70,000 "	34,000 "	21 R.p m.	140

FILTER PRESSES

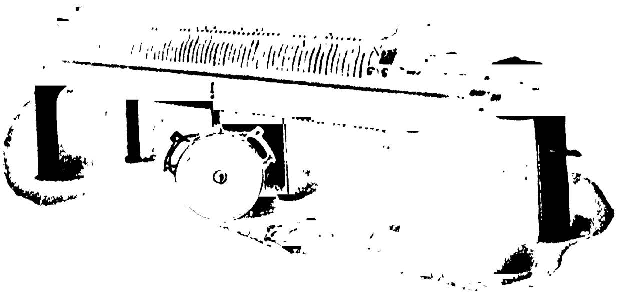
These presses represent the simplest process of separating liquids from solid matter in an economical manner Built with either round or square plates

Square Plate Presses- Made in 18", 24", 30" and 36" sizes, center and corner feed, plain and washing, either recessed plate or plate and frame types Regularly equipped with standard closing device, but can be furnished with hydraulic ram for closing



SQUARE PLATE FILTER PRESS

Round Plate Presses Made in 10", 16" and 27" sizes, center feed, either recessed plate or plate and frame types



ROUND PLATE FILTER PRESS

DATA PATTERSON FILTER PRESSES

Square plate				Round plate			
Size	No chbrs	Sq ft filtering area	Cu cap 1-in cake	Size	No chbrs	Sq ft filtering area	Cu cap 1 in cake
18	18	70	2.92	28"	72	202	20.5
	12	47	1.95	28"	60	168.5	17
	24	94	3.89	28"	48	134.75	13.5
	30	117	4.87	28"	36	101	10
24	24	169	7.03	28"	24	67.5	6.75
	30	211	8.79				
	36	253	10.25				
	42	295	12.30				
30	24	252	10.50				
	30	315	13.12				
	36	378	15.74				
	48	504	20.98				
36	36	561	23.36				
	42	654	27.26				
	48	748	31.15				
	54	841	35.04				

SPECIAL CHEMICAL EQUIPMENT

We are prepared to build special agitators, crushers, grinders, mills, mixers, and filter presses to meet any requirements that can not be fulfilled with our regular stock pattern machines.

PENNSYLVANIA WIRE GLASS COMPANY

EXECUTIVE OFFICES
Pennsylvania Building
PHILADELPHIA, PA.

Cable Address
"WIREGLASS, Philadelphia"

WORKS
Dunbar, Pa

PRODUCTS

Solid Wire Glass, also glass without wire netting, in various patterns and thicknesses.

PROTECTION

Wire Glass is a fire retardant, safeguard to human life, weatherproof, dustproof, reduces insurance rates and is an important factor in the building world.

Wire Glass, when cracked or broken, will not shatter and fall apart, injuring persons underneath, but it will remain intact until replaced, without doing any harm.

Wire Glass, when fire occurs, aids firemen in fighting the flames, as they have the protection of the glass back of which to fight with hose that can be put through a small opening in the glass.

Wire Glass prevents flames from attacking adjacent buildings.

USES

Wire Glass is used in all light openings where **fire protection** and **light** are desirable, such as in windows, doors, elevator enclosures, fire shutters, partitions, etc.

PATTERNS

Rough, Ribbed, Aqueduct (Drip-proof), Figured (Cobweb and Florentine), Polished (Transparent), and Corrugated Wire Glass (see opposite page).

THICKNESSES

⅛", $^3/_{16}$", ¼", ⅜", to suit all requirements.

SIZES

Sheets made up to 62" wide by 140" long. Special sizes cut to order.

APPROVAL, DISTINGUISHING MARK

All our **Wire Glass,** ¼" and over in thickness, has the **full approval** of the National Board of Fire Underwriters, which requires a distinguishing mark to identify the glass. Our distinguishing mark is our **Cabled Strand,** shown by arrow in illustration of polished wire glass.

HOW TO SPECIFY

In order to get our glass, be sure to specify **"Solid Wire Glass** made by the Pennsylvania Wire Glass Co."

Always look for **Cabled Strand.**

Specify width (i.e., distance across sheet) first; then length.

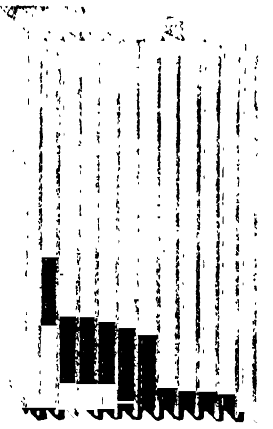
Always specify thickness and pattern desired.

SPECIALTIES

We make glass to suit every requirement.

For many purposes, such as transoms, partitions, doors, etc., a thin wire glass is desirable. To meet this demand, we make ⅛" thick Wire Glass in patterns as shown. This affords great saving in freight, as well as in steel sash, being so much lighter in weight than ¼".

⅛" wire glass affords moderate fire protection.



AQUEDUCT WIRE
Drip proof

AQUEDUCT

Another glass greatly in demand is **Aqueduct Wire Glass,** which prevents dripping from condensation. Aqueduct glass has deep supporting ribs or channels, and by capillary attraction, all condensation formed on the glass is held in the ribs and carried away, along the ribs, to the end of the sheet where it is taken care of.

Aqueduct is a great light diffuser and is very much stronger than other flat glass of like thickness

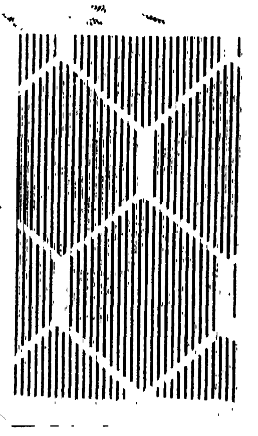
COBWEB

Cobweb is an attractive figured glass which affords great diffusion of light It is what is known as an "up-set" pattern. Used in partitions, transoms, doors, windows, etc.

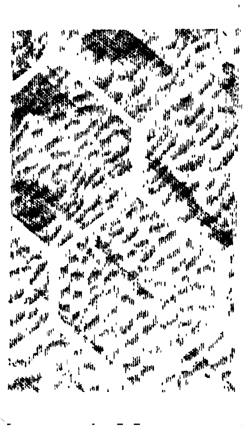
CORRUGATED WIRE GLASS

C.W.G. is another special product, one that has revolutionized the glass and building trades. For details see opposite page.

CATALOGS, SAMPLES, ENGINEERING ADVICE, ETC., FURNISHED WITHOUT OBLIGATION

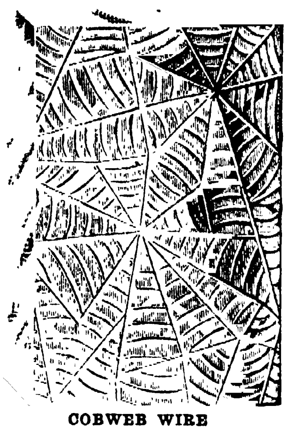


RIBBED WIRE



ROUGH WIRE

POLISHED WIRE
Transparent



COBWEB WIRE
New and unique

Continued on Next Page

CORRUGATED WIRE GLASS

C.W.G. is what the name implies—a sheet of **Wire Glass** corrugated like corrugated iron. (See illustration below showing joint, etc.)

Thickness—C.W.G. is about 5/16″ thick. Made in deep and shallow angles.
Deep—2½″ c. to c. of corrugations.
Shallow—2 11/16″ c. to c. of corrugations.

Standard Sizes—
Deep—27¾″ wide by 63″ and 42″ long.
Shallow—26½″ wide by 63″ and 42″ long.
(Other sizes can be cut if required.)

Weight—C.W.G. weighs about 4¼ lb. to the square foot unboxed and about 6 lb. boxed.

Uses—C.W.G. can be used in Roofs, Skylights, Side-Walls, Marquises, and any place where **Daylight** and **Fire Protection** are required.

Can be used in **old as well as new** buildings; also in combination with corrugated iron and asbestos.

Advantages—C.W.G. affords an all glass **daylight building**, with **no** glare or shadow.

C.W.G. diffuses the light and spreads it evenly to all parts of the building.

C.W.G. is the strongest glass made. This is due to the corrugation and method of manufacture.

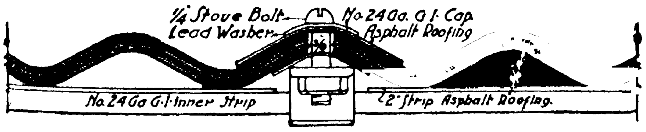
C.W.G. is easily and quickly installed; no skilled labor required; little upkeep.

C.W.G. is self-cleaning; cleans itself at each rainstorm.

C.W.G. affords great saving in steel; no special steel members required.

C.W.G., when installed, has ample room for expansion and contraction.

Each joint an expansion joint.



ILLUSTRATING EXPANSION JOINT FEATURE

Engineering Service—Our staff of engineers will submit working details and suggestions at all times, without obligation, and will make drawing showing how C.W.G. can best be applied to any particular requirement.

Send for Catalog No. 7; also samples.

ACTINIC (NO. 213) GLASS
HEAT INTERCEPTING

Ultra Violet and Infra Red Rays excluded by Actinic glass.

A special glass manufactured by this company only, it having been developed by it after long and arduous experiments.

No. 213 (Actinic) glass tested by U. S. Bureau of Standards. We will submit report if desired.

Actinic glass excludes about 85% of the ultra violet (glare) and 55% of the infra red (heat) rays, with exclusion of very little light.

Surfaces and Thickness—Actinic (No. 213) glass is made in Corrugated and all patterns and thicknesses to suit requirements. It is the ingredients in and not the color of glass that produce these results.

Protection—The protection of mills manufacturing products that are damaged by the action of ultra violet rays, such as rubber, etc.

Protection to the eyes (workers') by the exclusion of the infra red rays, eminent authority states:

"Heat Rays tire the eye when in excess, just the same as an overheated room tires the body."

No. 213 glass excludes a large proportion of the heat rays, thereby promoting efficiency.

The Human Machine—"The three important elements of the human machine are the brain, the eyes and the fingers. The eyes perceive, the brain directs and the fingers execute. To enable the eye to perform its function with the greatest possible ease and accuracy is therefore of first importance in any consideration of the conditions determining operative efficiency."

Glare—"Care should be taken to keep bright light sources out of the line of vision, no matter how distant they may be." Hence, the diffusion of the light rays by **corrugated wire glass** No. 213 is so essential.

Light and the Eye—"**Ultra Violet Rays** by their intense chemical action, have a destructive effect upon certain tissues of the organs of vision."

"The absence of **Red Rays** is also an advantage in removing one of the chief causes of eye fatigue and irritation."

Such harmful effects are eliminated, and all the **Actinic** advantages may be obtained by the use of our No. 213 glass.

THE PERMUTIT COMPANY

Water Rectification

Telephone
MADISON SQUARE 965

440 FOURTH AVENUE, NEW YORK, N. Y.

Cable Address
"PERMUTIT", New

BRANCH OFFICES

Albany, N. Y., 310 Journal Company Building
Boston, Mass., 10 Milk Street
Buffalo, N. Y., 304 Brisbane Building

Chattanooga, Tenn., 435 Volunteer State Bldg
Chicago, Ill., 208 So. LaSalle Street
Kansas City, Mo., 507 8 Lathrop Building
Los Angeles, Cal., 404 Wright Callender Bldg

Minneapolis, Minn., 1046 McKnight Bui
Pittsburgh, Pa., 921 Union Arcade
Philadelphia, Pa., 311 Widener Buildin

AGENTS

St. Louis, Mo., Reeves & Skinner Mchy. Co., 2211 Olive Street
Hamilton, Ontario, Can., W. J. Westaway Co., Main and McNab Sts.

Montreal, Quebec, Can., W. J. Westaway Co., 400 McGill Bldg
Winnipeg, Manitoba Canada, Stanley Brock, Ltd

Calgary, Alberta, Canada, Stanley Brock, Ltd

PRODUCTS

"Permutit" Zeolite Water Softeners, pressure and gravity types; Lime-Soda Softeners, intermittent, continuous and heater types; Lime-Barium Softeners, hot or cold types; Iron and Manganese Removal Apparatus, zeolite, mechanical and chemical types; steel, wood or concrete Clarifying Filters, pressure and gravity types; Filtration Equipment; Chemical Dosing Apparatus; Controllers; Gauges; Operating Tables; Oil, Sulphuretted Hydrogen, Chlorine, Ammonia, Removal Filters; Permutit-Folin for estimating ammonia in liquids.

ZEOLITE WATER SOFTENERS

The application of exchange silicates to water softening has been developed to such perfection by The Permutit Company, that water in any degree of hardness may now be softened to zero hardness with absolute dependability and scientific accuracy.

SOFTENING WATER WITHOUT CHEMICAL RE-AGENTS

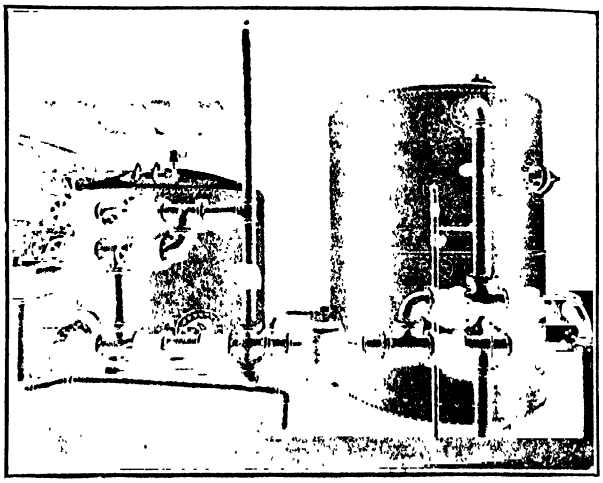
Upon passing water containing hardness through the Permutit Softener, the calcium and magnesium are completely exchanged for the sodium of the zeolite, and a neutral effluent is obtained, containing the equivalent of the original solids in harmless sodium salts, and free from hardness. The effluent is free from causticity, the process takes place in the cold, and the reaction is accomplished rapidly and perfectly. When all the effective sodium in the zeolite has thus been exchanged, it is restored by the simple means of passing a solution of common salt through it, the reverse action taking place. The sodium replaces the calcium and magnesium, which is discharged to the sewer, as a corresponding brine.

WATER SOFTENERS, ALL TYPES

The Permutit Company manufactures Lime-Soda, Lime-Barium Softeners of the intermittent or continuous types, for heater operation, or in the cold. They are designed to accurately serve every industrial need. Each machine is the perfected development of many years' experience in water softening, and represents the best acknowledged features of design with utmost dependability and economy of operation.

IRON AND MANGANESE REMOVAL

Iron and Manganese Removal Apparatus is generally complex in character and consists typically of combinations of apparatus developed and perfected for such work. Iron and manganese, whether in solution or suspension, whether existing as organic or inorganic salts, can be reduced to negligible quantities. Special Manganese Permutit has tremendous oxidizing powers and transforms manganese salts into insoluble oxides, removing them as the water passes through the bed.



A "PERMUTIT" ZEOLITE WATER SOFTENER AND "PERMUTIT" CLARIFYING FILTER

SPECIAL APPARATUS

Special apparatus for the removal of oil, sulphuretted hydrogen, chlorine, ammonia, etc. from water and, in conjunction with it, all types of correlated equipment such as chemical dosing apparatus, is sold under strict operating guarantees. Each piece is carefully designed and fabricated, and gives perfect satisfaction.

CLARIFYING FILTERS

Filters for removing turbidity and matter in solution are built in all sizes, for any capacity, to clarify water for any use. Such filters are made in pressure types of steel, and in gravity types of steel, wood, or concrete. They follow the principles of careful design and excellent construction that characterize all Permutit Products. Filtration equipment such as chemical feeding and solution apparatus, control devices, operating mechanisms, relief valves, laboratory equipment, is carefully correlated with Permutit filtration systems wherever sold, and carries with it the same guarantees.

SERVICE

Every piece of apparatus is sold by the Permutit Company under a definite guarantee of operation based upon an accurate analysis of the water supply and the requirements of the purchaser. A staff of engineers is maintained constantly in the field to assure the correct operation and to check the performance records of our installations, so that in buying Permutit equipment, you purchase not only excellent machinery but the hearty co-operation of a widely experienced organization as well. Send us a sample of your water for analysis.

LEONARD PETERSON & CO., INC.

Manufacturers of High Grade Laboratory Furniture

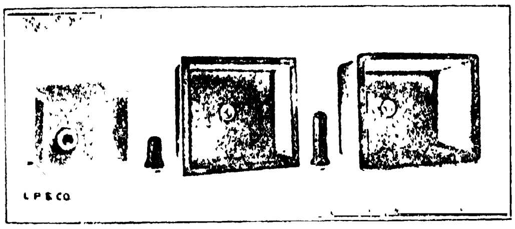
1222-1234 Fullerton Avenue
CHICAGO, ILL.

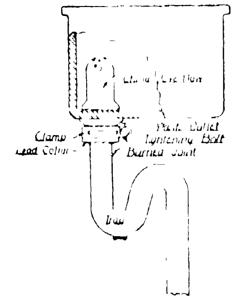
PRODUCTS

Laboratory Furniture for Industrial Plants, Commercial Laboratories, Educational Institutions, Hospitals, Domestic Science, Etc. We furnish the equipment complete, including Tables and Desks, Fume and Evaporating Hoods, Supply Cases, Acidproof Sinks, Gutters and Tops, Plumbing for Waste, Water, Gas, Air, Steam and Vacuum.

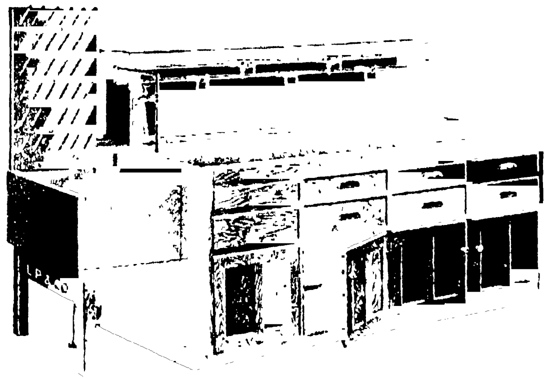
EXPERIENCE

The rapid growth of laboratories induced us to specialize in the manufacture of high grade furniture for all kinds of laboratories. For the past thirty years we have given special attention to the manufacturing of laboratory furniture. Our experience, plus frequent conferences with acknowledged authorities in science, enables us to furnish equipment that is in keeping with the growing demands of various sciences and industries.

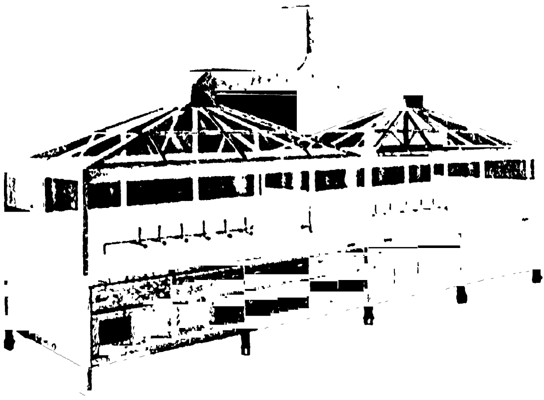




ACIDPROOF VITREOUS CHINA SINKS



LABORATORY TABLE NO. 1023



CHEMISTRY FUME HOOD NO 1000

SERVICE

Copy of our catalog showing various exclusive designs of laboratory furniture (a number of which are carried in stock for immediate shipment) will be mailed upon request. In addition to designs shown in our catalog, we also manufacture special designs.

If you intend furnishing a laboratory or are in the market for additional equipment, mail us a floor plan of the rooms you wish furnished, together with your suggestions and we will be pleased to send you blue prints, specifications, and estimate. This service is without cost or obligation.

We are located in the principal distributing center of the United States. Our shipping facilities are first class. In order to obtain the lowest freight rates possible, we ship all large pieces of furniture knocked down shape.

AMONG OUR CUSTOMERS WE WISH TO MENTION

Inland Steel Co.,
Indiana Harbor, Ind.
Newport Co.,
Carrollville, Wis.
New Jersey Zinc Co.,
Palmerton, Pa.
Mechanical Rubber Co.,
Cleveland, Ohio.
Oakland Motor Car Co.,
Pontiac, Mich.
National Candy Co.,
Chicago, Ill.
Timken Roller Bearing Co.,
Canton, Ohio.
University of North Dakota,
Grand Forks, N. D.
East Side High School,
Cincinnati, Ohio.
Dunlop Rubber & Tire Co.,
Buffalo, N. Y.
Carleton College,
Northfield, Minn.
Tubize Artificial Silk Co.,
Hopewell, Va.
University of Alabama,
Tuscaloosa, Ala.
Washington University,
St. Louis, Mo.
Nekoosa Edwards Paper Co.,
Port Edwards, Wis.

ROBERT S. PERRY, Pres. Paul W. Webster, V.-P. and [illegible]

PERRY & WEBSTER INC.

FORMERLY

Kalbperry Corporation

Telephone
STUYVESANT 7308

Cable Address
"PERWEB," New York

31 UNION SQUARE WEST, NEW YORK, N. Y.

SERVICES

Investigation of process problems and economies and utilization of wastes.

Design and supervision of plant and apparatus for technical manufacture of Chemicals, Metallurgical Products and Pigments, Paints and Varnish Productions.

Confidential investigations and reports for Executives, Banking and Financial interests.

Stackless Varnish Plants, Fume Recovery, Concentrating, Evaporating and Drying.

Concentrating Towers for sulphuric acid and other concentrations and spent acid recoveries.

Leak Proof All Masonry Construction for Glover, Gay Lussac and Chemical Treatment Towers and similar apparatus.

We design and furnish detailed plans, specifications, flow sheets, and instructions, for the erection and operation of chemical, metallurgical, paint, varnish, and other industrial projects; and where desired "housebreak" new operations and train employees.

We investigate operating or projected industrial activities for economy, efficiency, and feasibility, and to determine methods for improvement or the manufacture of desired products.

We do not undertake construction contracts nor purchase or sell materials, but sell only our services, and our experience, gained over many years as Executives, Constructors, and Operators, of manufacturing chemical, metallurgical and industrial enterprises.

We do give clients all information in our possession as to where specified materials and apparatus may be obtained, thus permitting contracts and purchases on a competitive basis in which we have no other interests than that of our client's welfare, and upon which we will accept no commissions of any character.

We believe that, having been engaged by a client, we become, in effect, a part of the client's organization and that our best interest lies in the scope and high character of the service we render.

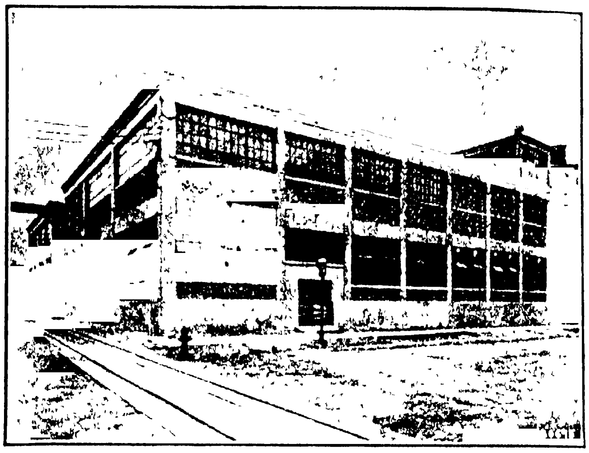
VARNISH FUME RECOVERY AND MULTIPLE STORY STACKLESS VARNISH PLANTS

The loss in "cooking" varnishes and similar products runs as high as forty per cent., the valuable portions of which are recoverable as usable products by our system of fume recovery.

The recoverable values are usually sufficient to pay for the entire cost of installation in from one to two years and the fume and smell is eliminated from the plant and neighborhood.

Fire risk with loss of goods in process is greatly reduced and large reductions in insurance rates have been obtained by our clients.

Our system does not interfere with or change pre-existing manufacturing methods or products.



A MODERN VARNISH PLANT OF 24 FIRES
Stackless, Odorless, Fire Preventive, Storage, Light

It is applicable to recoveries from Japans, Oils, etc., with proportionate results and it may be installed in existing plant.

The cost of operation is nominal and the cost of installation less than for brick stacks which are not required, and multiple story boiling plants are built with advantage.

Such plants are lighted from all four sides, provide storage for gums and oils in the top story from which they may be weighed and delivered direct into kettles on a lower story with minimum labor and with complete safety from accidental fire, provide storage for finished goods on a floor below the manufacturing room, and give package and shipping facilities on the ground floor.

We have furnished complete plans for plants of such multi-story construction, and for installation of our system in old style stack plants, to numerous clients among whom are some of the oldest and largest manufacturers of varnishes and similar products.

Special bulletins and descriptive information will be sent upon request.

Estimates of cost and license and engineering fees will be furnished upon information as to the number of fires, character of manufacturing operations, and, if for installation in an existing plant, sketches or description of the plant.

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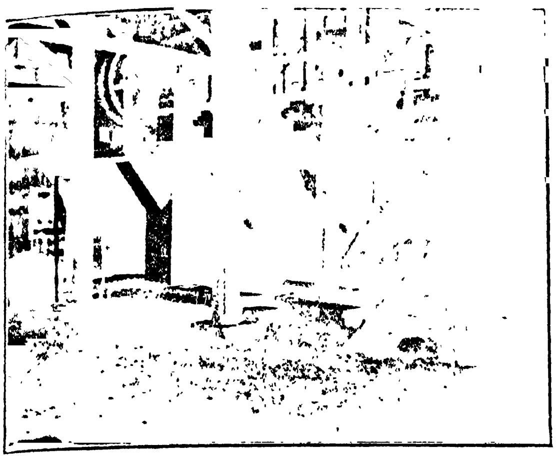


PLANT FOR THE CONTINUOUS EXTRACTION OF SULPHUR FROM SURFACE ORES. TOYAH VALLEY SULPHUR CO.

CHEMICAL FUME, DUST, ODOR, PREVENTION OR SUPPRESSION

Standardized apparatus generally used for dust collection and similar problems is rarely satisfactory and we provide the remedy in special designs and processes and have a record for valuable recoveries including even commercial returns from smell nuisances.

We have yet to record a failure in this class of work.

CONCENTRATING TOWERS

These towers, originally designed for the concentration of sulphuric acid, have been in successful commercial use for many years. They are applicable to the concentration and evaporation of other liquids at a very low cost and provide the cheapest known means for the commercial concentration of sulphuric acid.

They are quickly constructed from standard stock materials at low first cost, and, with almost complete freedom from repairs, are operated at practically the cost of fuel, with minimum labor.

LEAK PROOF MASONRY CONSTRUCTION FOR GLOVER, GAY LUSSAC, CONCENTRATING, DENITRATING AND TREATMENT TOWERS

Many attempts have been made to omit lead or other sheathing in constructing masonry towers, but with indifferent success owing to the fact, inherent in operation, that the unequal expansion induced by unequal temperature changes, impossible to avoid, is greater than the elasticity of the materials of construction; with the inevitable formation, sooner or later, of cracks in the masonry.

In our method of leak-proof masonry construction the attempt is not made to achieve the impossible, but, by a novel method of construction such inevitable cracking as will take place is so controlled as not to extend to the exterior and the necessity of sheathing with its accompanying cost is rendered unnecessary.

Estimates of construction cost furnished upon information of requirements.

DRYERS AND DRYING

In our dryers the basic laws of heat transference, evaporation, the moisture carrying properties of air, gases, etc., have been recognized and applied with engineering skill in the economic use of materials of construction, to produce the greatest efficiency of drying, with special reference to economy in labor cost of handling materials, and are designed in each instance to meet the conditions of the specific problem.

Inquiries for information should give full information as to material and its physical form and condition, moisture content carried and desired, quantity to be handled per unit of time, available sources of heat, maximum temperature which the material itself may be allowed to attain without injury, description of existing means for drying, and any general information bearing on the problem.

PURIFICATION AND DEODORIZING OF VEGETABLE AND ANIMAL OILS

By a new and novel process in the application of heat, vacuum temperatures and conditions are approximated in open vessels and without the expensive apparatus used for vacuum operations.

The low investment cost as compared with vacuum apparatus, or with high pressure super-heated steam apparatus, the operating cost approximating vacuum results with ability to maintain low temperatures, the extreme simplicity and low maintenance cost and continuous operation all combine to make this the ideal method of purifying and deodorizing animal and vegetable oils.

CONCENTRATION AND EVAPORATION OF LIQUIDS AND SEMI-LIQUIDS

The above apparatus has a wide field of application for this work.

The apparatus is easily and quickly installed, gives continuous operation at very low cost, and with its operation at vacuum temperatures under atmospheric pressures offers many surprising possibilities.

ACTIVITIES

Space prevents enumeration of all the various activities with which the members of our organization have been intimately connected but they include all the mineral acids, lactic acid, chemical salts, alum, and alumina hydrate, pigments, paints, varnishes, red and white lead, many chemical and paint specialties, lithopone, blanc fixe, the drying of materials, and concentration and evaporation of liquids and semi-liquids, the general fabrication of iron and steel products, machinery, and concrete construction.

THE PFAUDLER COMPANY

The World's Largest Makers of Glass Lined Steel Equipment

ROCHESTER, N. Y., U. S. A.

New York, 1802 World's Tower Bldg   Chicago, 1442 Conway Bldg   San Francisco, 206 Sharon Bldg

FOREIGN AGENCIES

Enamelled Metal Products Corp., Imperial Bldgs., 56 Kingsway, London, W C 2, England

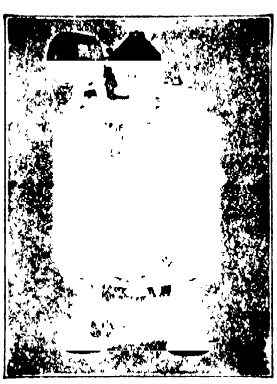
Mauri Bros & Thompson, 123 131 Castlereagh St, Sydney, N S W, Australia

PRODUCTS

Glass Lined Mixing and Storage Tanks, Steam Jacketed Kettles, Vacuum Pans, Pressed Steel Pots and Small Tanks, Jacketed Stills, Crystallizing and Evaporating Pans, Vats, Tilting Kettles and Percolators, Truck and Car Tanks, Laundry Chutes, etc.

This equipment is lined with an impenetrable coating of glass, acid resistant, easy to clean, and not subject to the effects of sudden changes in temperature. This glass lining is fused into the metal of the equipment so that it is in reality an integral part thereof,—gives to the plant the same advantages of using glass lined containers in large scale operations as is present in the use of laboratory glassware, with the additional advantage of durability of steel.

JACKETED MIXER (with enameled steel agitator)



JACKETED MIXER
Showing construction

This tank is made of all-welded, heavy plate steel, is lined with the famous Pfaudler Brown Acid-resistant Glass Enamel, and is equipped with our standard, enameled steel agitator. The jacket of this tank, as of all our other models, is constructed of steel which is as thick as that of the inner tank itself. The gears are made of cut steel, and are enclosed in a housing, as shown.

The inner tank has an enameled outlet through a welded connection in the jacket, which feature eliminates leaky stuffing boxes. Flanged or threaded nozzles, or other suitable openings are provided. The manhole cover is also enameled, and is secured either as illustrated, or by hinges. This type is suitable for use in the manufacture of raw chemicals, dyes, printing inks, coal tar by-products, etc.

Capacity — 150 gallons and upward.

JACKETED MIXER
(with agitator off center)

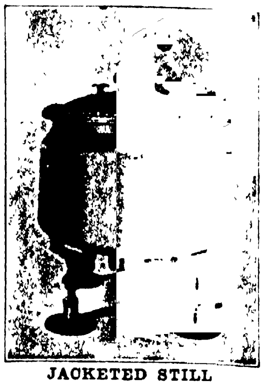
JACKETED MIXER
Agitator off center

This tank will provide for very thorough agitation, and has solved many difficult problems in mixing. It is equipped with our standard enameled steel agitator, and can be furnished with a removable cover.

Capacities — 50 gallons and upward.

PARTIAL LIST OF SOLUTIONS HELD IN PFAUDLER EQUIPMENT
Hydrochloric Acid (dilute or concentrated), Sulphuric Acid (dilute or concentrated), Arsenic Acid, Muriatic Acid, Rectified Alcohol, Nitric Acid (dilute or concentrated), Paratoluidine, Amylacetate, etc.

JACKETED STILL (with reducing ell)

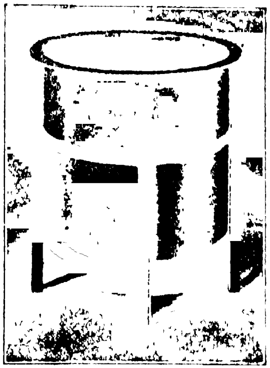


JACKETED STILL

Jacket and Enameled Body of this still are welded into a single piece; the top head is bolted on, and is furnished with observation glasses; the manhole cover is enameled, and is secured in the same way as on the Jacketed Mixer. There is an enameled reducing ell, bolted to the welded-on, flanged nozzle in the head, and designed for attachment to a condenser. There is also a flanged or threaded enameled outlet through a special connection welded to the jacket. This type is suitable for the distillation of essential oils, and acids, the reduction of fats, etc.

Capacities—50 gallons and upward.

SMALL TANKS AND POTS

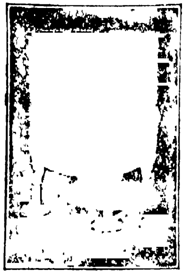


SMALL TANK

This pot is made of pressed steel, seamless drawn, and is well suited for the handling of small batches, and for experimental work. It is equipped with a basket support, as shown, and is light enough to be easily handled.

Capacities—10 to 60 gallons.

ONE PIECE OPEN TANK

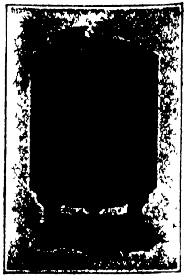


OPEN TANK

This tank is all welded, and is our standard open construction. It may be equipped either with welded-on enameled, flanged, or threaded nozzles, or with standard pipe bushings. It may also be furnished with the standard side agitator. This type is suitable for temporary storage and holding, intermediate holding, etc.

Capacities—50 gallons and upward.

ONE PIECE CLOSED TANK



CLOSED TANK

This tank is also all-welded, is provided with suitable outlets, and with side agitator, if desired. It is suitable for the storage of such products as perfumes, essential oils, etc.

Capacities—200 gallons and upward. Similar construction can be furnished in smaller sizes.

PARTIAL LIST OF INDUSTRIES USING PFAUDLER EQUIPMENT
General Chemical, General Cosmetic, Pharmaceutical, Food and Canning, Dairy, Beverage, Hospital Field, etc.

THE PHILADELPHIA DRYING MACHINERY CO.

"Hurricane" Dryers

OFFICE AND WORKS
1 Stokley St

PHILADELPHIA, PA.

BOSTON OFFICE
53 State St

PRODUCTS

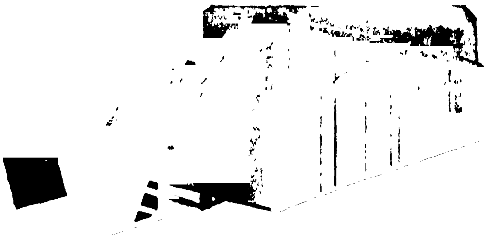
"Hurricane" Dryers of the Truck Tray type, Cabinet Tray type and Continuous Conveyor type, built for the color, chemical, dyestuff, pharmaceutical, textile, leather, tobacco and allied industries.

DESCRIPTION

"Hurricane" Dryers consist of a rigid, structural steel framework, assembled in accordance with the latest approved engineering practice, with removable outside panels of sheet steel insulated with asbestos, which retain the heat, and at all times give easy access to the interior of the machine.

These panels are excellent non-conductors. They are securely attached to the framework by means of strong hand latches, and prevent the escape of heat from the dryer.

The drying is accomplished by the recirculation of large volumes of heated air, driven by means of steel-blade fans, alternately across the steam coils and over the wet material. Special exhaust ducts carry away the excess moisture-laden air, and the intake ducts supply a sufficient amount of fresh air. The temperature in the dryer can be controlled automatically.



AUTOMATIC SECTIONAL APRON DRYER
For Raw Stock, Nitrated Cotton, Reclaimed Rubber, Rags, Hair, etc.

TUNNEL TRUCK DRYER
For Lithopone, White Lead, Dry Colors, Ceramic Ware, etc.

TRUCK DRYER
For Chemicals, Colors, Dyestuffs, etc.

CABINET TRAY DRYER
For Chemicals, Pharmaceuticals, etc.

Because of the simple, fire-proof construction, the efficient recirculation system, and easy operation of the machines, vast economy is effected in time, labor, floor space and steam consumption.

Uniform drying of the material is absolutely guaranteed.

DESIGN

During our many years of drying experience, we have designed standardized equipment of various sizes and capacities, to suit all ordinary requirements. Where these standard machines cannot be used, we are prepared to submit plans and details for special apparatus to suit the particular needs.

SOLVING YOUR DRYING PROBLEMS

Our Research Department, fully equipped with experimental dryers, operated on a commercial scale, is at your disposal. You can call on us at any time, without expense or obligation, to assist you in solving your drying problems.

Send us samples of the materials to be dried. They will be promptly tested and returned to you, with a report of the results obtained and our recommendations as to the best and most efficient methods for handling your products during the drying operation.

PHOTOSTAT CORPORATION

299 STATE ST., ROCHESTER, NEW YORK

Boston	Chicago	New York	Philadelphia	San Francisco	Washington
88 Broad Street	19 South La Salle Street	7 Dey St	1102 North American Building	429 Monadnock Building	700 G Street N

Executive Office: Providence, R I

AGENCIES
Alfred Herbert, Ltd, Coventry, England, Paris France, Milano, Italy, Brussels Belgium
Amsterdam Holland Calcutta India, Yokohama, Japan, Sydney, Australia
Graham Brothers Stockholm, Sweden

PRODUCTS

The Photostat.

The photographic copying machine.

Photostat Paper.

Photostat Chemicals.

The word **Photostat** is the registered trade-mark for our products in the United States, Canada, Great Britain, and most of the other countries of the world.

DESCRIPTION

The machine is loaded with a roll of special sensitized paper. The subject to be copied is photographed directly upon this paper and no intermediate film or glass plate negative is used. As fast as the photographic copies are exposed they are cut off and developed and fixed right in the Photostat itself. The copies are then washed and dried and are ready for use. The whole operation takes but a few minutes.

The Photostat is made in three models, all of them equipped with either a book holder or an engineering copy board.

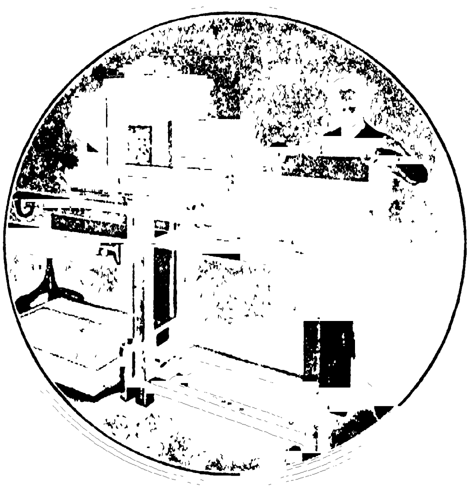
PHOTOSTAT DATA

Model No	Largest Size of Copy	Size of Book Holder	Size of Engineering Copy Board	Floor Space
1	11½"x14"	21"x26"	23"x36"	4'x8'
2	14" x18"	21"x26"	31"x40"	5'x10'
3	18" x22"	21"x26"	39"x48"	6'x12'

All of these models can be readily adjusted to copy subjects larger than the copy boards if desired.

USES

To make copies of.
- Pencil Drawings,
- Ink Drawings,
- Blue Prints,
- Tracings,
- Sketches,
- Maps,
- Letters,
- Telegrams,
- Tabulations,
- Record Cards,
- Reports,
- Contracts,
- Documents,
- Specifications,
- Data Sheets,
- Pages from Books,
- Insurance Records,
- Shipping Lists,
- Patent Drawings,
- Illustrations for Salesmen,
- Production Sheets,
- Advertising Layouts.



PHOTOSTAT IN USE

PIPE RAILING CONSTRUCTION CO.

LONG ISLAND CITY, N. Y.

PRODUCTS

Pipe Railings of Black and Galvanized Iron and Steel Pipe for:

- **Bench frames**
- **Boardwalk railings**
- **Bridge railings**
- **Drying racks**
- **Engine room railings**
- **Fencing**
- **Gallery railings**
- **Machine guards**
- **Panel board frames**
- **Platform railings**
- **Retaining wall railings**
- **Runway railings**
- **Stair railings for**
  - **Concrete, Iron or**
  - **Spiral stairways**
- **Storage racks**
- **Table frames**
- **Turnstiles**
- **Walkway railings**
- **Workbench frames**

We also produce Special Fittings.

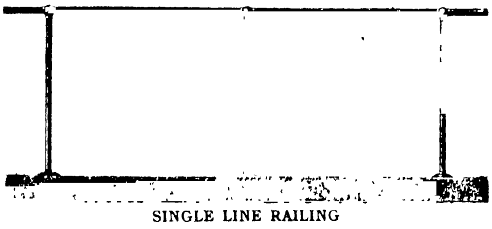
SERVICES

Our service consists of making up, from customers' dimension drawings, railings or special forms from pipe and fittings When desired, we will prepare drawings and submit estimates if conditions and measurements are furnished.

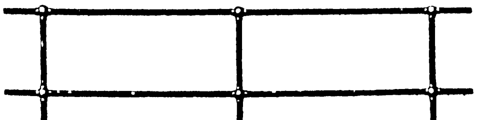
PIPE RAILINGS

These railings are made up of iron or steel pipe with the necessary fittings such as elbows, tees, crosses, bends and foot plates. All cutting, threading and fitting is done in our shops where we have the necessary machinery to perform the various operations accurately This eliminates all unnecessary preliminary fitting and cutting, and saves considerable time in the erection of the railing.

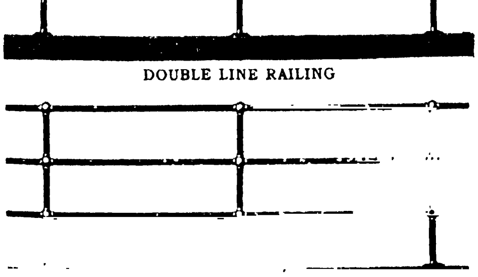
Posts and as many units as possible are assembled in the shop, horizontal and long vertical lengths of pipe are cut, bent if necessary, and threaded, and each piece marked to facilitate erection



SINGLE LINE RAILING



DOUBLE LINE RAILING

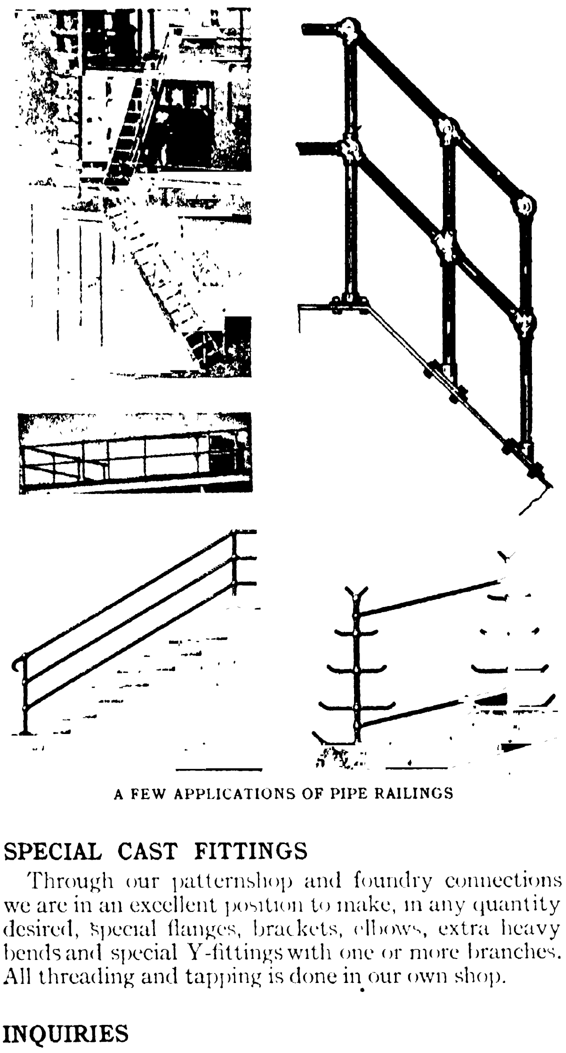


TRIPLE LINE RAILING

Advantages A railing of iron or steel pipe is more durable and affords greater protection than wooden railings which are more likely to break under sudden or undue strains The pipe railing is also less expensive than mesh or picket fencing, and furthermore is more easily made up for short turns, off-sets, or irregular shapes.

SPECIAL FORMS

Aside from our regular business of making pipe railings, we are also prepared to make special forms of equipment using pipe and fittings These comprise table and bench frames, racks of all kinds, machine guard skeletons, etc



A FEW APPLICATIONS OF PIPE RAILINGS

SPECIAL CAST FITTINGS

Through our patternshop and foundry connections we are in an excellent position to make, in any quantity desired, special flanges, brackets, elbows, extra heavy bends and special Y-fittings with one or more branches. All threading and tapping is done in our own shop.

INQUIRIES

When asking quotations for railings, special forms or special fittings, send dimension drawings or blue prints and specifications stating the sizes and quantity desired.

PITTSBURGH VALVE, FOUNDRY AND CONSTRUCTION COMPANY

ENGINEERS FOUNDERS PIPE-FITTERS MACHINISTS

NEW YORK, 30 Church St.
CHICAGO, 650 McCormick Bldg.

26th Street and A. V. R. R.
PITTSBURGH, PA.

PHILADELPHIA, 1323 Widener Bldg.
CLEVELAND, 1250 Rockefeller Bldg.

ATWOOD

PRODUCTS:

COMPLETE PIPING SYSTEMS for Industrial Chemical Plants of every Description for handling Steam, Water, Gases, Oils and Various Liquids in connection with the Processes of Manufacture.

Hydraulic Piping Systems of every Description.

VALVES:

Accumulator
Aiken Hydraulic Operating
Aiken Stop
Atmospheric Relief
Back Pressure
Blow-Off
Butterfly
Check
Chronometer
Critchlow Hydraulic Operating
Exhaust Relief
Float
Foot
Gate
Globe, Angle and Cross
Hydraulic
Non-Return
Plug
Register
Relief
Shock
Stuart Hydraulic Operating
Tanner Hydraulic Operating
Throttle
Transfer

The above types of valves can be supplied for high and low pressures, in all sizes and for all services.

SPECIAL VALVES:

We design all kinds of special valves and our experience is such that we feel safe in stating that no matter how peculiar your valve requirements may be, we can adapt or design something to suit the case.

CASTINGS:

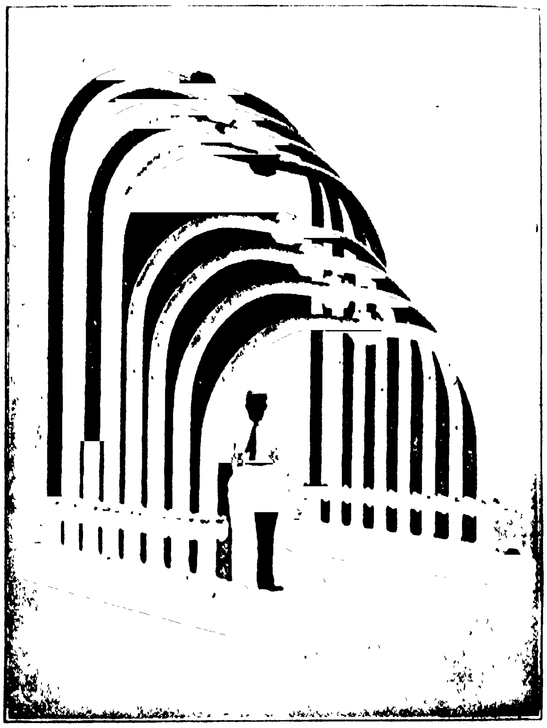
All kinds of special castings made and machined, including Furnace Castings, Pots, Retorts, Kettles, Valve Castings, Large Pipes and Fittings, etc.

WELDED WORK:

Headers, Manifolds, Fittings, etc., made with our patented "Interlock Welded Necks," and "Atwood Line Welds."

CAST STEEL VALVES, FITTINGS, ETC., for use with Superheated Steam at all pressures.

Valve Fittings and Appliances, Piping, Steam Separators, Exhaust Heads, Etc.



The above illustration shows a type of welded construction often required for superheaters, coolers, heaters, condensers, etc.

SERVICES:

Complete Piping Contracts executed for Chemical Works, Oil Refining Plants, Rubber Factories, Sugar Refineries, Soap Factories, Pulp and Paper Mills, Bleacheries and Textile Finishing Plants, Metallurgical Plants and all kinds of Industrial Undertakings.

The designing is done by experienced engineers; the manufacturing is in the hands of skilled workmen and is carried out in a large and most completely equipped plant, under competent supervision; the erection is in charge of capable engineers, under whom are a large staff of expert workmen.

When unusual difficulties are encountered in Power House or Process Piping, they are met with special valves, fittings or pipe bends. Tanner, Aiken or Critchlow Valves, Bottom Outlet Gate Valves, and many other special valves go to make up a complete line.

Continued on Next Page

EQUIPMENT:

Our plant consists of Iron Foundry, Steel Foundry, [illegible] Foundry, Pattern Shop, Large Machine Shop, [illegible] Cutting, Bending and Welding Shops, Pattern [illegible] Houses, Warehouses, Power House, Engineer-[illegible] Dept., Etc.

[illegible] machine tool equipment is thoroughly up-to-date. [illegible] of our machines have been designed and built especially for our use.

STANDARD SPECIFICATIONS:

Our standard specifications have been adopted by leading high pressure concerns in the United States, a copy of which will be furnished on request.

GUARANTEE:

Our trade-mark is on all goods made by us, and we believe in maintaining its reputation. We fully guarantee our goods for the service sold.

ATWOOD

CASTINGS:

Whenever the Highest Grade of Grey Iron Semi-steel or Cast Steel Castings are required in the Chemical Industries, our plant can meet your needs, as we have excellent facilities for making and machining any such castings, no matter how large or intricate.

We do not make castings of special acid-proof irons, preferring to leave that branch to firms who specialize in it.

We will be pleased to have Chemical Engineers and Works Managers submit drawings and specifications to us for estimate. Frequently we can suggest important improvements and economies in equipment, as a result of our many years' experience in making large and intricate castings.

GATE VALVES:

Made in parallel and taper seat types. For exhaust, water, air and gas, the parallel seat type is recommended; while for medium and high pressure steam and hydraulic service, the taper seat type is recommended.

All types and sizes made either outside screw and yoke, or inside screw Patterns are so arranged that valves can be made all iron or with bronze, monel or special mountings.

MOTOR OPERATED GATE VALVES:

We have applied motor drives to gate valves for various classes of work, using either direct or alternating current Gearing for our motor operated gate valves is designed to meet the requirements of strength and compactness. All gear teeth are cut Motors fitted with graphite bearings which require no oiling or other attention.

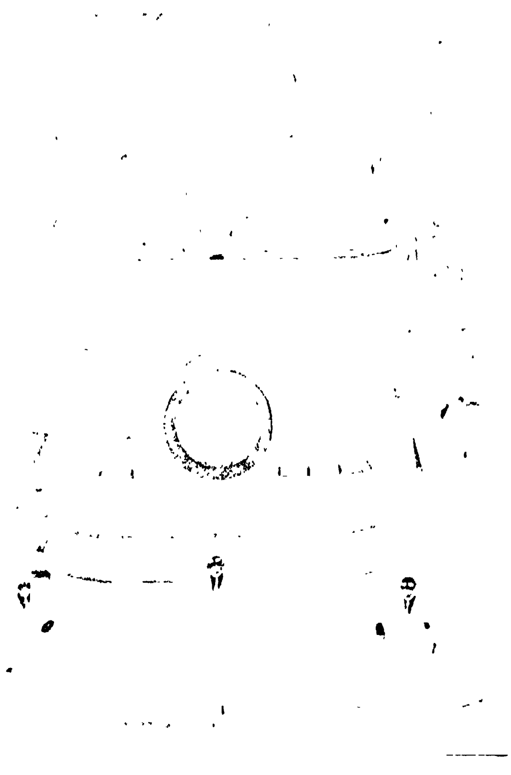
Unless otherwise specified, Stuart limit controller is used exclusively for this service, consisting of two automatic circuit breakers, mechanically operated, and incased in a box mounted on the gate valve yoke out of reach of operator, thus making it impossible for him to interfere with their proper functioning

Underwriters' specifications have been met in all our designs.

CYLINDER OPERATED GATE VALVES:

Built for any pressure or service Motive power may be water, air or steam If gaseous, as steam or air, placing the cylinder in a horizontal position is recommended. If, however, a vertical position can not be avoided, special attachments to meet conditions will be furnished.

Flanged Cast Steel Cross with Side-outlet. We make all kinds of Flanged Special Cast Iron and Cast Steel Fittings. This illustration also is typical of the work we do in making and machining special castings



10' 9" x 7' 6" Exhaust Connection Between 17000 K. W. Turbine and Condenser. Made for Jones & Laughlin Steel Co., Pittsburgh, Pa.

Continued on Next Page

STEAM SEPARATORS:

We build numerous types of steam separators, many of which are useful in connection with evaporating, drying and distilling equipment and other chemical plant purposes.

In these separators, every condition for good separation is met.

The standard horizontal, vertical and angle separators are made with cast iron bodies and wells.

Receiver type separators are made of semi-steel bodies and wrought steel wells. They are constructed upon the same general principles as the smaller separators.

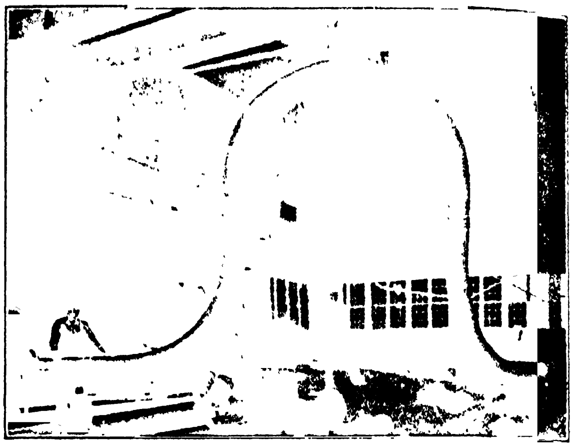
The welded receiver type separators have necks welded in by the "interlock" method. This type is guaranteed to be absolutely tight and has proved its reliability under the most severe service.

STUART TWO-PRESSURE OPERATING VALVES:

Used extensively by the largest rubber manufacturers for operating heaters and presses with high and low pressure water.

Supply of high pressure water is controlled automatically, and can not be turned on at the wrong time, nor can either the high or low pressure be turned into the waste.

Operation is very simple. Moving lever up or down will raise or lower the press, using low pressure water only. When moulds come against the head of heater, or top of press, high pressure water is automatically turned on to squeeze moulds and low pressure is automatically cut off. After curing process is complete, lever is pulled as far as possible, which shuts off high pressure water and waste water in press.

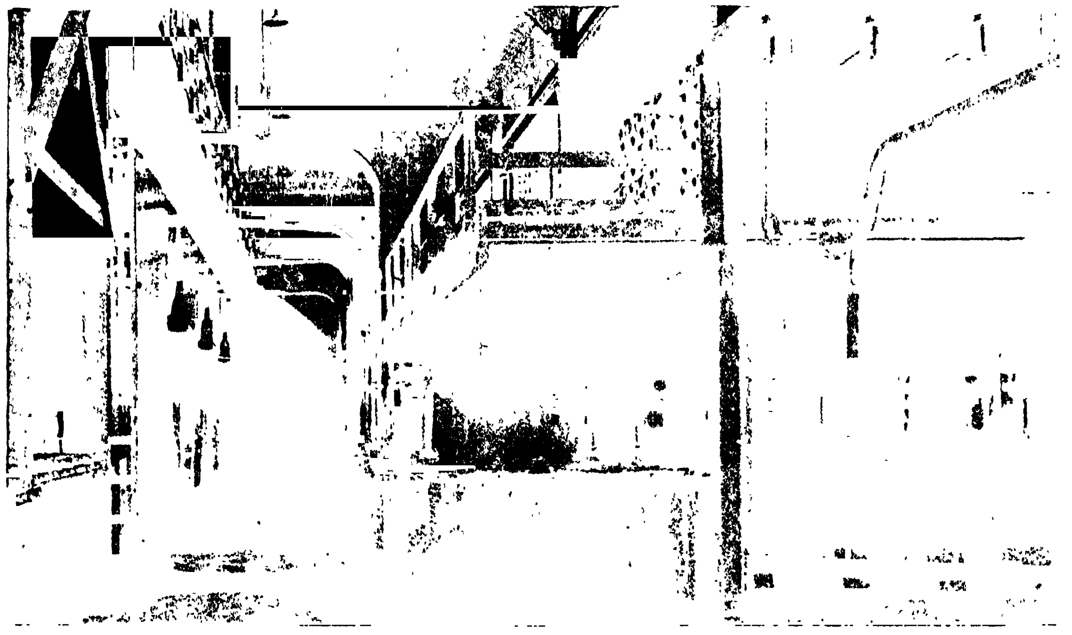


Large Pipe Bend Containing 53 feet of 14-inch Pipe. The three lengths are connected by the "Atwood Line Weld." On account of its size it could not be shipped by rail. A river barge was used to convey it to the plant for which it was designed

This valve saves high pressure water; increases output; is foolproof; saves money and annoyance.

LITERATURE:

We publish a Catalogue of over 650 pages, containing not only complete descriptions of all our lines of iron, steel and brass valves, fittings, etc., together with tables of dimensions, but also much useful mechanical engineering information. We will be pleased to consider requests for copies of this Catalogue from Chemical Engineers or Plant Managers, Etc.



Phosgene Plant of Edgewood Arsenal, Edgewood, Md.

PITTSBURGH-DES MOINES STEEL COMPANY

Designers, Manufacturers and Erectors of Structural Steel and Steel Plate Work

808 CURRY BLDG., PITTSBURGH, PA.

OFFICES

New York, N. Y., 208 Hudson Terminal
Chicago, Ill. 1208 First Nat'l Bank Bldg
San Francisco, Cal., 308 Rialto Bldg
Detroit, Mich., 1108 Book Building

OFFICES

Washington, D. C. 308 Munsey Bldg
Dallas, Tex. 1208 Praetorian Bldg
Des Moines, Iowa, 908 Tuttle Street
Chatham, Ont. 208 Inshes Ave

Pittsburgh Pa   Chatham, Ontario Canada 208 Inshes Ave   Des Moines, Iowa

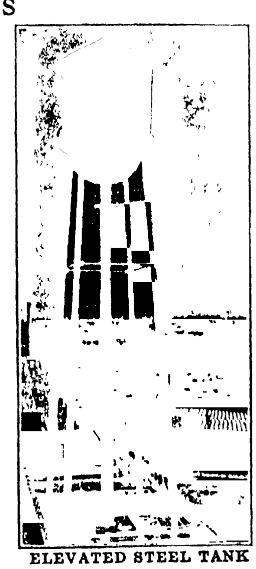
PRODUCTS

Elevated Steel Tanks; Standpipes; and Steel Storage Tanks of all Types and Sizes, for Industrial, Municipal, and Railway Service.

Agitators; Bleachers; Condensers; Complete Oil Refineries; Cylindrical Containers for Storage, or for High or Low Pressures; Stills; Riveted Steel Pipe; Smoke Stacks; Mill Buildings and Manufacturing Plants; Store, Office, School and Church Buildings; Barges; Bins; Dredges; Coaling Stations; Wireless Towers; Bridges; Viaducts; Etc.

ELEVATED STEEL TANKS

Furnished for Industrial, Municipal, and Railway Service, for Domestic Consumption, Fire Protection, Boiler Feed Water, Etc.



ELEVATED STEEL TANK

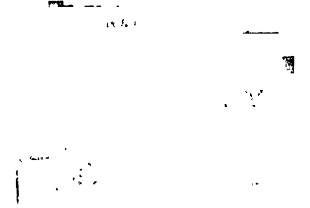
LIST OF STANDARD DIMENSIONS

Rated Cap U. S. Gals.	Diam. D	Dist. h	Cylinder C
10,000	11'0"	4' 0"	10'11"
15,000	13'0"	6' 0"	10'11"
20,000	15'0"	5' 5"	10' 9"
25,000	15'0"	5' 4"	14' 7"
30,000	15'0"	5' 3"	18' 5"
35,000	17'0"	6' 4"	15' 7"
40,000	17'0"	6' 8"	18' 5"
45,000	19'0"	6' 5"	15'11"
50,000	19'0"	8' 0"	17' 7"
60,000	19'0"	7' 3"	22' 6"
70,000	21'0"	7' 7"	21'10"
75,000	21'0"	8' 0"	22' 6"
80,000	21'0"	8'11"	24' 2"
90,000	21'0"	8' 0"	28' 4"
100,000	24'0"	8' 6"	22' 6"
125,000	24'0"	8' 4"	30' 0"
150,000	28'0"	10' 5"	24' 2"
200,000	28'0"	10' 5"	35' 0"
250,000	32'0"	13'11"	33' 0"
300,000	32'0"	15' 0"	40' 3"

h = Net Depth Bottom
C = Height of Cylinder
h + C = Total Net Depth of Tank.

Please furnish the following information when requesting quotations on Elevated Steel Tanks:

1. Capacity in gallons.
2. Height of tower to lowest point of bottom.
3. If tank is used for sprinkler service, specify insurance organization having jurisdiction.
4. State which, if any, of the following are included in tank contract: a. Main Riser, b. Frost Casing, c. Tank Heater, d. Heater House, e. Underground Piping and Valves, f. Concrete Foundations.
5. The erecting conditions at site. Distance to nearest railroad siding. If erected on a building, give the number of stories and dimensions and spacing of the supporting columns.



STANDARD STEEL OIL STORAGE TANK

STANDARD STEEL OIL STORAGE TANKS

For Producers and Refiners, as well as for the Consumer of Fuel Oil in large quantities, we manufacture and erect standard tanks from 500 to 80,000 barrels capacity. We, of course, design, manufacture and erect special oil storage tanks of every description.

OIL STORAGE TANKS, STANDARD SIZES

T'k No	Capacity Bbls	Capacity Gals	Height	Diam	T'k No	Capacity Bbls	Capacity Gals	Height	Diam
7	**5,140**	**216,000**	**30'0"**	**35'0"**	**15**	**25,010**	**1,050,000**	**30'0"**	**77'0"**
8	5,175	217,500	20'0"	43'0"	16	30,320	1,274,000	30'0"	85'0"
9	10,200	428,000	25'0"	54'0"	17	35,520	1,491,000	30'0"	92'0"
10	**10,500**	**441,000**	**30'0"**	**50'0"**	**18**	**37,870**	**1,590,000**	**30'0"**	**95'0"**
11	15,230	640,000	25'0"	66'0"	19	40,300	1,690,000	30'0"	98'0"
12	15,100	635,000	30'0"	60'0"	20	45,380	1,906,000	30'0"	104'0"
13	20,200	849,000	25'0"	76'0"	21	50,770	2,132,000	30'0"	110'0"
14	**20,560**	**864,000**	**30'0"**	**70'0"**	**22**	**55,495**	**2,330,000**	**30'0"**	**115'0"**

Tanks listed in bold face type are carried in stock, completely fabricated, ready for immediate shipment. Others can be fabricated quickly from plate stock.

All tanks are equipped with ladders or stairways, flanges, manholes, swing pipes and winches, according to the specifications of the purchaser.

Detailed designs will be submitted upon request.

The supporting conical roof may be either of steel, or of wood covered with No. 22 gauge sheets.

Dome Roof Tanks—Dome Roof Oil Storage Tanks have the advantage of eliminating roof supports within the tanks. They are, however, limited to a diameter of 43 feet.

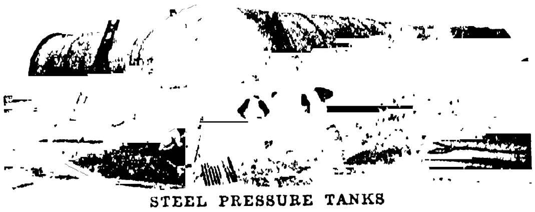
Dome Roof Tanks are particularly adapted to use as "run down" tanks, or for divided storage. The roofs are caulked gas tight.

DOME ROOF TANKS—STANDARD SIZES

Tank No.	Capacity Bbls	Capacity Gals	Height	Diameter
1	560	23,500	10'0"	20'0"
2	**1,118**	**47,000**	**20'0"**	**20'0"**
3	**2,185**	**91,800**	**25'0"**	**25'0"**
4	2,520	105,800	20'0"	30'0"
5	3,140	131,800	25'0"	30'0"
6	4,050	170,000	25'0"	34'0"
7	**5,140**	**216,000**	**30'0"**	**35'0"**
8	5,175	217,500	20'0"	43'0"

Tanks listed in bold face type are carried in stock, completely fabricated, ready for immediate shipment. Others can be fabricated quickly from plate stock.

All tanks are equipped with ladders or stairways, flanges, manholes, and other features according to the purchaser's requirements. Detailed designs will be furnished on request.



STEEL PRESSURE TANKS

SERVICE

A letter addressed to our nearest branch office will put you in touch with our organization. With no obligation on your part, one of our engineers will gladly call upon you, determine your requirements, design your equipment if necessary, and quote prices either erected complete or f. o. b. our shops.

We have a large erecting department, which has erected Des Moines products in every part of the world,

PNEUMATIC SCALE CORPORATION, LTD.

Automatic Machinery for Handling, Weighing, Packaging, Sealing and Labeling All Classes of Packaged Goods

MAIN OFFICE AND FACTORY
NORFOLK DOWNS, MASSACHUSETTS
BRANCH OFFICES
Boston New York Chicago London, England Paris, France

PRODUCTS

Machinery for the packaging, weighing, sealing and labeling of all free flowing products such as:

Barley-Pearl
Beans
Borax
Bran
Cereals
Chocolate and Cocoa
Cocoanut
Coffee
Corn Meal
Cream of Tartar
Crumbs, Bread
Dried Fruit and Vegetables
Drugs
Farina
Flour
Gelatine
Hominy
Infants' Food
Macaroni
Mustard
Noodles
Peas, Split
Poultry and Stock Remedies
Powder, Baking
Powder, Face
Powder, Jelly
Powder, Photo Fixing
Powder, Talcum
Powder, Tooth
Rice
Salt
Salt, Epsom
Seed, Bird
Soap Chips
Soda, Baking
Soda, Bicarbonate
Soda, Sal
Spaghetti
Spices
Starch
Sugar
Sulphur
Tapioca
Tea
Vermicelli

Also machines for labeling fibre cans, tins, etc., and the net weighing of material and capping of tins and cans.

PNEUMATIC AUTOMATIC PACKAGING MACHINERY

Pneumatic Automatic Packaging Machinery makes possible the economical and efficient packaging of chemicals and food products in types of packages best adapted to the preservation and easy handling of the contents and at a cost much less than the actual cost of wrapping by clerks necessary in bulk selling.

Pneumatic Packaging Machinery saves an enormous waste due to inaccurate weighing and insures the material reaching the ultimate consumer clean and in the best condition and protects both the manufacturer and purchaser from substitution of inferior products.

In operation, Pneumatic Packaging Machinery is entirely automatic, each set of machines performs the work of twenty to forty hand operators. The illustration at the bottom of the page shows a complete set of Pneumatic Weighing and Packaging Machinery made up as follows:

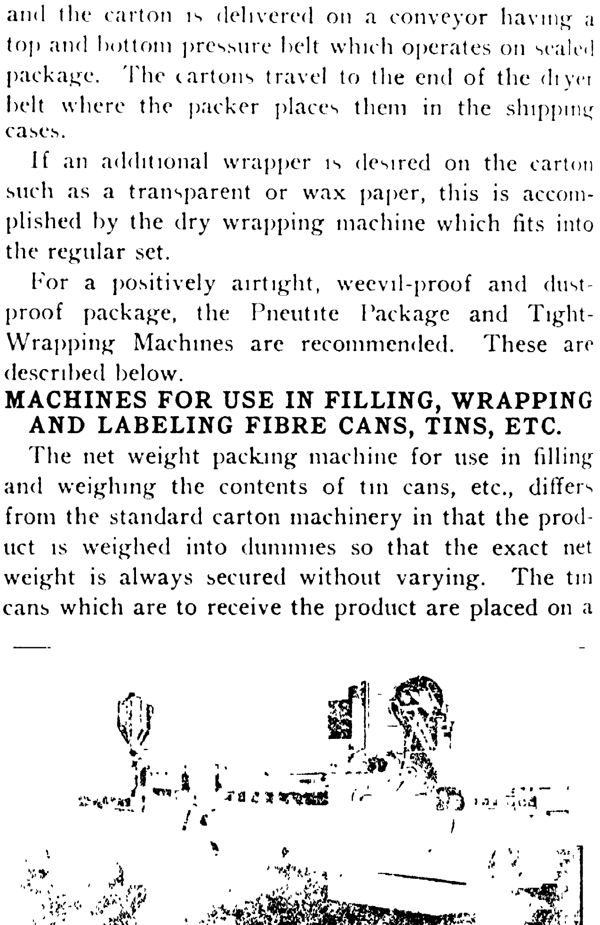
The Pneumatic Carton Feeder opens and feeds the cartons to the bottom sealer. The bottom sealer seals the bottom end, passes it on to the lining machine. The lining machine takes the paper from a roll, cuts it off and carries it into the carton on a forming block. The block is then withdrawn, leaving the lining perfectly made with all the seams securely sealed together and the whole lining closely adhering to all sides of the carton. From the lining machine a conveyor belt now carries the carton to the filling and weighing machine. From the first hopper of the filling and weighing machine—a rough load is automatically weighed into the carton. The carton is then carried to the scale pan where a fine stream load from a second hopper gives it its true weight. From this second scale the carton passes along to the top sealing machine where the flaps are folded and securely sealed and the carton is delivered on a conveyor having a top and bottom pressure belt which operates on sealed package. The cartons travel to the end of the dryer belt where the packer places them in the shipping cases.

If an additional wrapper is desired on the carton such as a transparent or wax paper, this is accomplished by the dry wrapping machine which fits into the regular set.

For a positively airtight, weevil-proof and dust-proof package, the Pneutite Package and Tight-Wrapping Machines are recommended. These are described below.

MACHINES FOR USE IN FILLING, WRAPPING AND LABELING FIBRE CANS, TINS, ETC.

The net weight packing machine for use in filling and weighing the contents of tin cans, etc., differs from the standard carton machinery in that the product is weighed into dummies so that the exact net weight is always secured without varying. The tin cans which are to receive the product are placed on a



COMPLETE PACKAGING EQUIPMENT

Continued on Next Page

vor belt by hand and carried along to the machine. As they pass under a dummy into which the al has been previously weighed, the bottom and the material drops down into the can The pass from the machine over a set of tappers which tap the can and settle the contents.

filled cans then travel along the receiving belt can capper into a position where dies close the top of the can, holding it firmly in place the cover, which is held in a pair of movable s carried down and pressed on the can.

cans now travel along the receiving conveyor can labeling machine and come to rest against package elevator. While the can is being lifted upward by the elevator it picks up the label which has fed from the top of the stack at the rear end of the machine and carried through a tank of tempered water the paste roll. In this operation the label is wrapped around the can and thoroughly pressed into place. From the can labeler, the can is carried to the Pneumatic dryer, capable of holding nine hundred cans. The label in drying is shrunk onto the can, thus closely adhering to the surface and making a perfectly tight seal between cover and can.

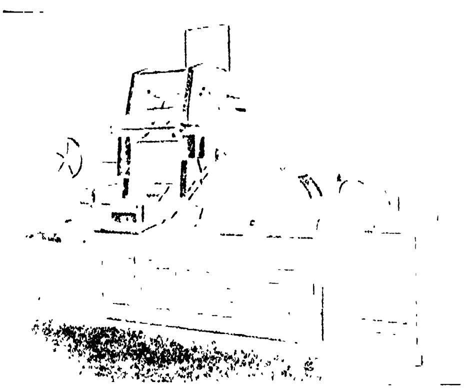
PNEUMATIC BAG FLOUR WEIGHERS

The Pneumatic Bag Flour Weighers embrace three types of machines. The first covers a range from two to seven pounds, the second a range from two to twelve pounds and the third machine covers a range from twelve to forty-nine pounds.

The general operation of weighing is practically the same with the bag machines as with the carton machines which have already been described above.

THE PNEUTITE PACKAGE AND THE TIGHT WRAPPING MACHINE

The type of package represented by the Pneumatic Scale Company's "Pneutite" has been thoroughly tested out by the United States Government Department of agriculture and found to be the one best solution for the protection of cereals from weevils. It is likewise absolutely dust-tight and air-tight and is especially valuable for use with powders, such as soap powders, which are inclined to sift out through the ends of an ordinary carton not thoroughly sealed.



PNEUMATIC TIGHT WRAPPING MACHINE

The manufacturer finds that the "Pneutite" Package is actually weevil-proof and air-tight. It is more economical from all standpoints, compared with the cylindrical package. It permits the use of the least expensive cartons. It saves inward freight bills. It stores flat, and saves 90% of factory storage space. It packs closely in the container and thus saves 20% of outward shipping and storage expense for manufacturer, jobber and retailer. It may be made of absolutely pure stock, no oil, no treating solutions. It is exceptionally attractive and has a high display value. It is the manufacturers' insurance against spoiled goods and backfires from retailers and consumers. No opportunity for contamination from an adjacent weevil-infected package on grocery shelves is possible.

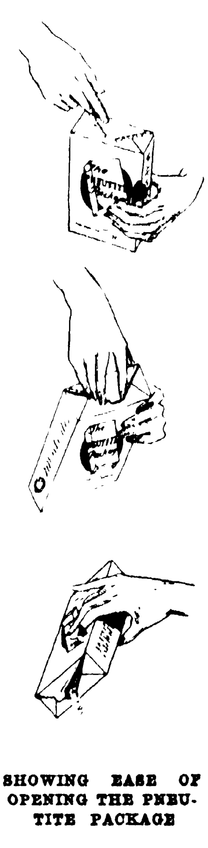
The housewife finds that this new package is handy for the new Lok-Top design makes pouring easy and the cover cannot come off. It is sanitary. The hinged cover seals the package after use dust-tight. It is her assurance that the contents come to her in a clean and wholesome condition, never infected with insects and she does not pay for an expensive package. It is also convenient to keep on her pantry shelf.

The Pneumatic Tight-Wrapping Machine illustrated below has made this tight-wrapped carton possible and economical to produce. The carton itself is made the same as an ordinary carton, but of much cheaper stock,—the cheapest grades of chip-board being equally satisfactory. Where the Lok-Top is desired, special dies must be used so that the use of a blunt knife on the top will reveal a hidden cover.

After packing, weighing, sealing in the usual manner, the Pneutite Package passes to the tight-wrapping machine which shrinks on a label closing every seam and edge of the box. This label being shrunk on is absolutely free from wrinkles and leaves no opening in which insects may lay their eggs. It seals the carton airtight and protects the contents against moisture and from sifting.

INFORMATION

Full information upon any of the machines manufactured by the Pneumatic Scale Corporation, Ltd., will be gladly sent upon application to the home office or to any of the branch offices given above.



SHOWING EASE OF OPENING THE PNEUTITE PACKAGE

PNEUMERCATOR COMPANY, INC.

15 PARK ROW, NEW YORK, N. Y.

PRODUCT AND SERVICE

Pneumercator Gauges.

Indicate the depth and weight or volume, specific gravity or Baumé of any liquid, fluid or viscous, acid or alkaline, at any temperature.

USE

Tanks, Standpipes or Reservoirs.

A Pneumercator Gauge installed in any tank will provide a perpetual inventory of the liquid stored in the tank—an accurate check on liquid put in or withdrawn from the tank.

The gauge will operate with equal accuracy on tanks open to the atmosphere or under pressure or vacuum.

The accuracy is not affected by changes in temperature of the liquid in the tank or the temperature through which the pipe line connecting the tank to the indicating portion of the apparatus passes.

There are no floats, diaphragms or delicate mechanism of any kind to stick or get out of order.

APPLICATION

Fuel oil tanks
Lubricating oil tanks
Crude oil tanks
Cutting oil tanks
Acid tanks
Molasses tanks
Gasoline tanks
Kerosene tanks
Chemical storage tanks
Paint oil tanks
Light paint tanks

Stills
Evaporators
Automatic sprinkler tanks
Automobile tank trucks
Reservoirs
Standpipes
Flumes
Tail races
Dams
Water works
Tide fluctuations, etc.

PRINCIPLE

The operation of all models of "Pneumercator" gauges is based on the maintenance of a true hydrostatic balance between the head of the liquid to be measured and a column of mercury or other indicating medium, the pressure being transmitted by air confined in a small connecting tube between the liquid and the gauge.

CONSTRUCTION, FOUR ELEMENTS

1 A balance chamber or chambers, located in the liquid to be measured

2 A mercury or other gauge, located wherever it is desired to take readings

3 A hand pump or other source of compressed air

4 A control valve attached to the gauge and connected by small piping to the balance chamber and to the source of compressed air.

QUOTATIONS

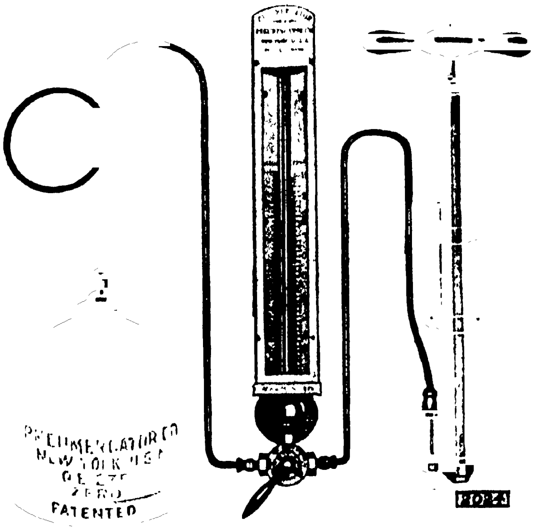
As each "Pneumercator" Gauge has to be made up for the specific purpose for which it is to be used, in order to advise and quote you intelligently it is necessary that we have the following information:

The dimensions of tank (or tanks)
The distance from the tank to the point where the indicating section of the instrument is to be located
The nature and specific gravity of the liquid to be measured

Prices and full information will be promptly furnished on request.

NOTICE

The coined word "Pneumercator" is registered as our trade-mark and attached to all instruments sold by us, our representatives or licensees under our patents throughout the world.



ESSENTIAL PARTS OF THE "PNEUMERCATOR" GAUGE

PNEUMERCATOR GAUGE MODEL S. T. I.

S. T. I. GAUGE

This type is applicable to straight-sided tanks, containing liquids which have a constant specific gravity and which are to be measured in units of depth or volume. Also applicable to the straight-sided tank containing liquids of varying specific gravity where an accurate reading in weight is desired or where an approximate reading in depth or volume will suffice. For horizontal cylindrical tanks, whose contents have a varying specific gravity, it will give an approximate reading in units of depth, weight or volume.

The scales may be graduated in units of depth, weight or volume corresponding to each half inch of tank depth.

Types furnished in five sizes—16", 24", 32", 40" and 48", depending upon the depth of the tank and specific gravity of the contents.

MODEL S. T. I. ELECTRICAL GAUGE

Is the Standard S. T. I. type fitted with a commercial annunciator which rings a bell and indicates visually whenever the tank content has reached a predetermined level.

Annunciator can be furnished for high or low level alarm, or both, and is actuated by the mercury. There are no electrical connections at the tank and thus fire hazard from short circuits is eliminated.

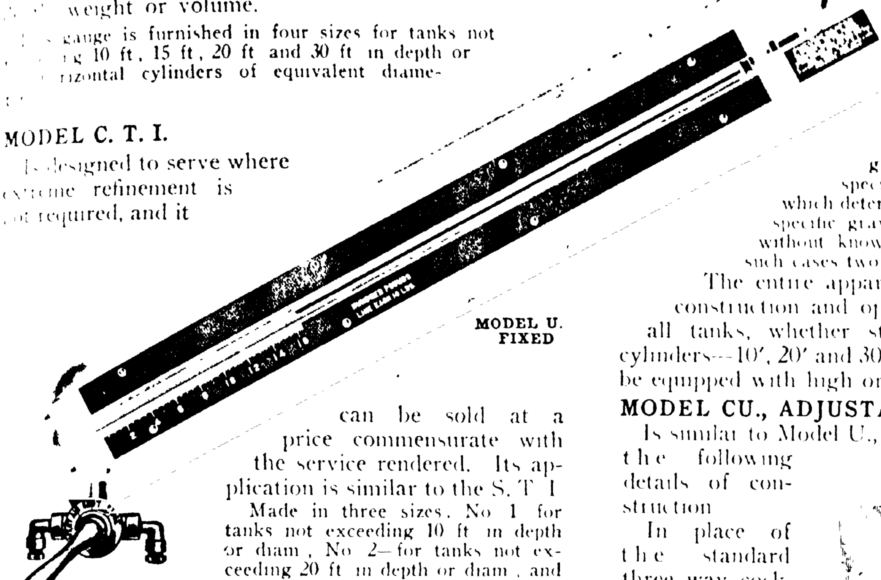
Continued on Next Page

MODEL U., FIXED

model has the same application as the Model S. T. I. but is furnished for installations where a reading than that given by the S. T. I. model red, as the scales may have a mark for each uter inch of tank depth.

scales may be graduated to read in units of weight or volume.

gauge is furnished in four sizes for tanks not ig 10 ft, 15 ft, 20 ft and 30 ft in depth or rizontal cylinders of equivalent diame-



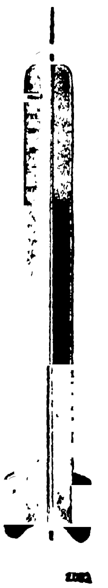
MODEL U. FIXED

MODEL C. T. I.

Is designed to serve where extreme refinement is not required, and it can be sold at a price commensurate with the service rendered. Its application is similar to the S. T I

Made in three sizes. No 1 for tanks not exceeding 10 ft in depth or diam, No 2—for tanks not exceeding 20 ft in depth or diam, and No 3—for tanks not exceeding 30 ft in depth or diam It may be graduated in units of depth, weight or volume with a mark for each one-half inch of tank depth

Made in vertical direct reading type and furnished complete with hand air pump, mercury, mercury catcher and balance chamber.



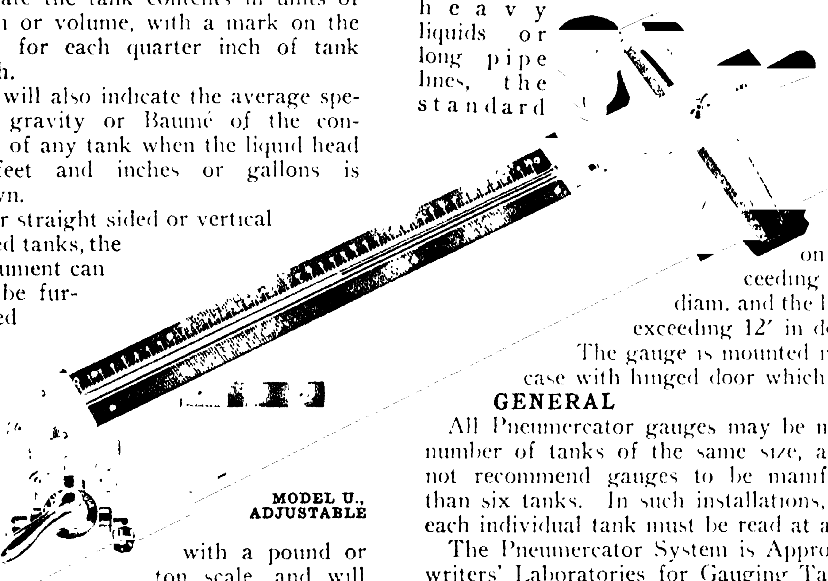
MODEL CTI

MODEL U., ADJUSTABLE

Model U., Adjustable Gauge is adjustable to varying specific gravities and when the movable indicating column is set with the pointer at the, observed specific gravity or Baumé, will accurately indicate the tank contents in units of depth or volume, with a mark on the scale for each quarter inch of tank depth.

It will also indicate the average specific gravity or Baumé of the contents of any tank when the liquid head in feet and inches or gallons is known.

For straight sided or vertical walled tanks, the instrument can also be furnished with a pound or ton scale, and will indicate the tank contents in pounds or tons regardless of changes in the specific gravity. The pound or ton scale can not be furnished for horizontal cylindrical tanks.



MODEL U., ADJUSTABLE

Application — This equipment is applicable to conditions where at least one factor is known.

For cases where none of the factors are determinate, the Model U Adjustable inclined gauge may be equipped with a specific gravity or Baume finder, which determines any desired factor average specific gravity or Baume depth or volume, without knowing any factor beforehand In such cases two balance chambers are employed.

The entire apparatus is extremely simple in construction and operation. It is applicable to all tanks, whether straight sided or horizontal cylinders—10′, 20′ and 30′ in diam and depth. It may be equipped with high or low level alarm.

MODEL CU., ADJUSTABLE

Is similar to Model U., Adjustable, differing only in the following details of construction

In place of the standard three way cock, it is equipped with simple shut-off valve. The air pump is enclosed in the case, and the balance chamber is smaller than that of the standard type.

MODEL CU ADJUSTABLE

When a gauge is to be used on heavy liquids or long pipe lines, the standard balance chamber is recommended.

Application—It is built in two sizes—the smaller type for service on tanks not exceeding 6′ in depth and diam. and the larger tanks not exceeding 12′ in depth and diam.

The gauge is mounted in an aluminum case with hinged door which can be locked.

GENERAL

All Pneumercator gauges may be manifolded to a number of tanks of the same size, although we do not recommend gauges to be manifolded to more than six tanks. In such installations, the content of each individual tank must be read at a time.

The Pneumercator System is Approved by Underwriters' Laboratories for Gauging Tanks Containing Hazardous Liquids.

THE PORCELAIN ENAMEL & MFG. CO.

PEMCO

Eighth and O'Donnell Streets
BALTIMORE, MARYLAND

PEMCO

PRODUCTS

Porcelain Enamels for Cast Iron and Sheet Iron.

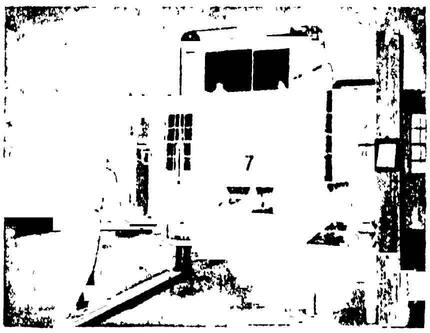
Installations for Enameling.

GENERAL

The Porcelain Enamel & Mfg. Company is an organization of experienced and practical Enamelers.

The Company operates a large and successful Porcelain Enameling Plant in Baltimore for enameling products made of sheet iron and cast iron; it also operates successfully a large Porcelain Enameling Plant at Detroit, Michigan.

Besides these two plants the company has installed numerous Enameling Plants in many cities from ocean to ocean. Most of these plants are Porcelain Enameling Departments for manufacturing concerns; some are independent plants for the enameling of various specialties.



ENAMELING FURNACE

The company has manufactured for years in the Baltimore plant certain Vitreous Enamels, which it has been furnishing to all of the out-of-town plants. These enamels, known as "PEMCO ENAMELS," are recognized as the best product in this line.

The reputation of the company has been built up by, firstly—making Enamels that are not only much superior, but are in fact the only perfectly serviceable enamels for certain purposes; secondly—these enamels always run absolutely uniform, both in quality and shade, and the application is simple and economical; thirdly—the company, through a highly trained staff of service men, assists its customers to attain the highest efficiency in their Porcelain Enameling Departments.

SPRAYING OPERATION

Pemco Cast Iron Enamels are sprayed directly on to the cast iron, without any intermediate or primary coat, also called slush or ground coat, as is necessary with other enamels. Pemco cast iron enamels are fused in a very low temperature (1100 to 1300°F.), preventing warping even of delicate castings.

Pemco Sheet Iron Enamels are either dipped or sprayed on the articles to be enameled. They are burned or fused in temperatures from 2000 down to 1400°F.

Pemco Enamels do not merely lay on the surface, but sink in and fuse with the iron base.

There is no other enamel that adheres with the same tenacity, shines with the same brilliancy, or stands up as well under wear and use like PEMCO Enamel.

THE PEMCO PROPOSITION

Equipment—The Pemco Organization will design your Porcelain Enameling Plant and furnish and install for you—ready to do business—a complete and efficient Enameling Equipment at a fixed price.

Enamels—Pemco will furnish you dependable Porcelain Enamels suited for your particular purpose Pemco is the largest producer of Porcelain Enamels

Service—Pemco Service in connection with Pemco Enamels is the feature which made the name "PEMCO" famous. Pemco has the long experience which helps our friends to do good porcelain enameling economically right from the start.

Pemco puts your plant in operation, shows you how to do the work right, and keeps a general supervision over your Enameling Department to insure maximum production.

"PEMCO IS RELIABLE"

PORTABLE MACHINERY CO., INC.

Manufacturers of the Scoop Conveyor

PASSAIC, N. J.

Address
“Passaic”

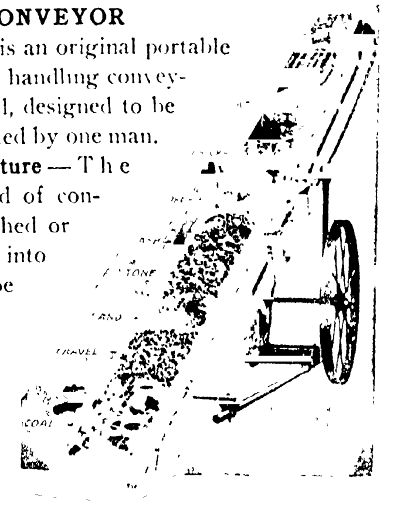
Western Union
A B C 5th Edition

PRODUCTS
Portable Belt Conveyors

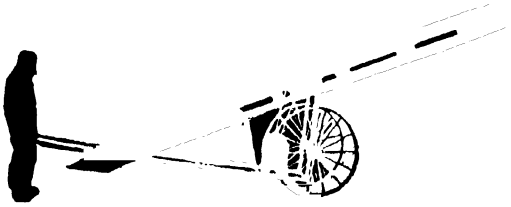
THE SCOOP CONVEYOR

This conveyor is an original portable type material handling conveyor with scoop end, designed to be moved and operated by one man.

Exclusive Feature—The scoop or feed end of conveyor can be pushed or completely buried into the material to be conveyed; the belt receiving its load over the scoop—**a feature found in no other belt conveyor.**



SHOWING EXAMPLES OF MATERIALS HANDLED

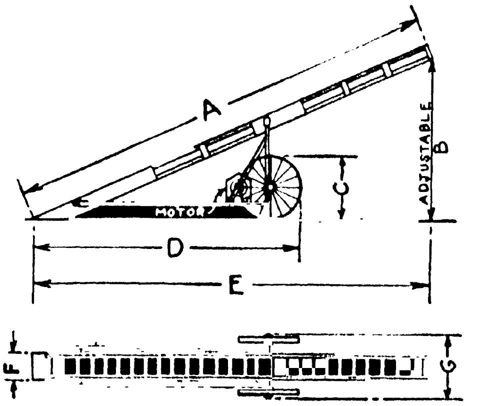


EASILY MOVED

Guarantee—We guarantee the carrying belt to handle at least 5000 tons of coal or 4000 tons of ashes or sand, making belt renewals cost less than one and one-half cents per ton handled; all other parts guaranteed against defects in workmanship and material for one year. There are now over 5000 Scoop Conveyors in use, many in the chemical industry. This we consider one of the best guarantees a purchaser can have that the machine is a profitable investment.

MATERIAL FED BY SCOOPING

Dimensions—See accompanying diagrams. The 14 ft size conveyor is suitable for loading and unloading box cars or loading industrial cars and for general use in limited space



DETAILS AND DIMENSION DATA SCOOP CONVEYORS

Size	A	B	C	D	E	F	G
12" x 14'	14'	4' to 6'	12"	9'6"	12'5"	17"	13"
16" x 14'	14'	4' to 6'	12"	9'6"	12'5"	21"	17"
12" x 20'	20'	6' to 9'	12"	12'0"	18'3"	17"	13"
16" x 20'	20'	6' to 9'	12"	12'0"	18'3"	21"	17"
12" x 24'	24'	9' to 12'	12"	13'3"	22'6"	17"	13"
16" x 24'	24'	9' to 12'	12"	11'3"	22'6"	21"	17"
12" x 30'	30'	12' to 15'	12"	16'6"	27'0"	17"	13"
16" x 30'	30'	12' to 15'	12"	16'6"	27'0"	21"	17"

Both the 20 ft. and the 24 ft. size are suitable for loading and unloading trucks or cars and for stacking materials. The size most suitable is governed by the height and reach required to meet operating conditions.

Capacity—One ton in one minute.

Weight—800 lbs. to 1600 lbs.

Horse Power—2 H. P. and 3 H. P.

Power—Machines furnished with either electric motor or gasoline engine. If customer supplies motor, the Company will provide motor support and drive from motor shaft. Drive reductions are carried in stock for any motor speed from 700 r.p.m. to 1800 r.p.m.

When Writing or Ordering—State operating conditions, kind of material to be handled, power available, where material is received, delivered, etc.

PILING WITH THREE SCOOP CONVEYORS

DIRECT FROM CAR HOPPER TO PILE

POWER PIPING COMPANY

Industrial Piping Engineers

829 BEAVER AVE., PITTSBURGH, PA.

BRANCHES
Cleveland O., Power Piping Co., 30 Euclid Arcade Annex
Chicago, Ill. Power Piping Co., 1107 Peoples Life Bldg

REPRESENTATIVES
New York, N. Y., C. W. Bergen & Co., 256 Broadway
Washington, D. C., H. A. G. C. H. Young 210 Albee B

PRODUCTS

Piping Systems complete in every detail, including design, construction, and erection, for every industrial purpose.

Acetylene welding in all its branches.

We have constructed a great variety of special welded equipment—heaters, superheaters, coolers, condensers, piping, etc.—for oil refiners and plants employing special chemical processes.

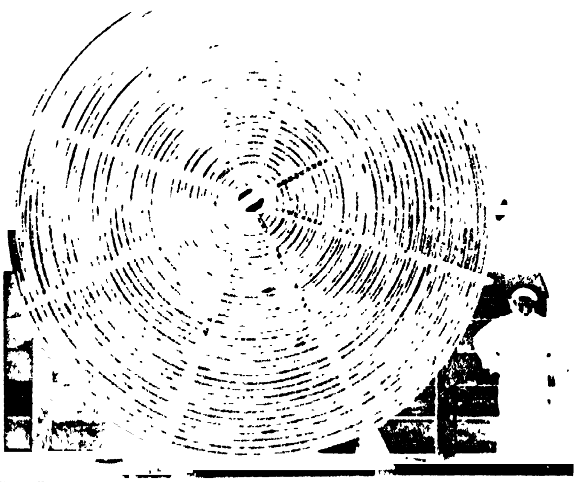
FACILITIES AND SERVICES

The requirements of the present day for piping systems are extensive and vitally important to economical operations on large scale industrial production.

We feel that the examples of our work shown in these pages will enable prospective buyers to see that our organization is equipped in every way to build piping systems no matter how large or how complicated.

COMPLETE PIPE SYSTEMS

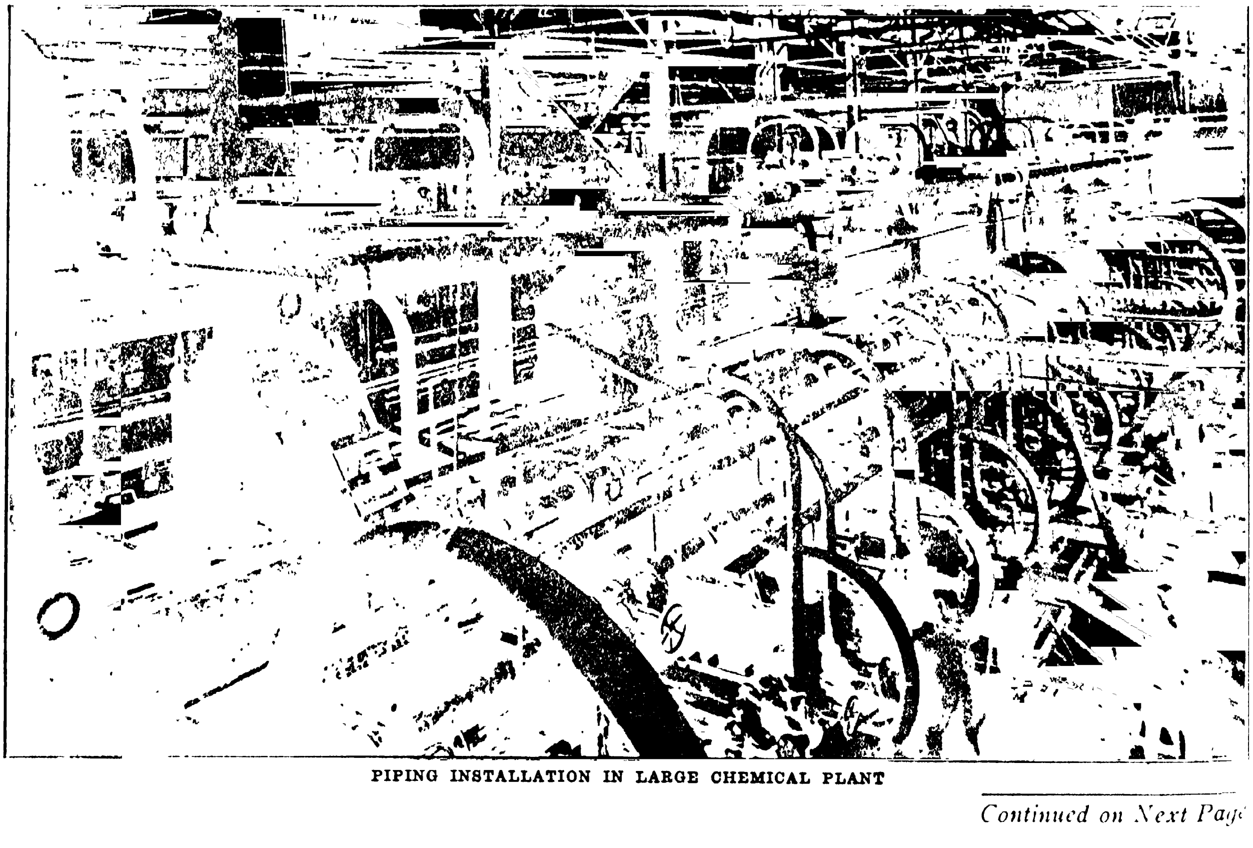
The two illustrations shown here are examples of some of the large piping systems we are equipped to build. Note the many different angles of the pipe bends, and the large pipe diameters. These examples of our work show the extent of our facilities for the most complicated piping installations.



HEATING COIL FOR TREATING LUBRICATING GREASE IN PETROLEUM REFINERY

HEATING AND COOLING COILS

We build coils for process work especially suitable for chemical plant requirements because they are capable of giving good service under the severe conditions encountered. Perfect bends, welds, and flange connections at inlet and outlet are essential. The unusually large coil shown here will serve to illustrate how well fitted we are to build this equipment.



PIPING INSTALLATION IN LARGE CHEMICAL PLANT

Continued on Next Page

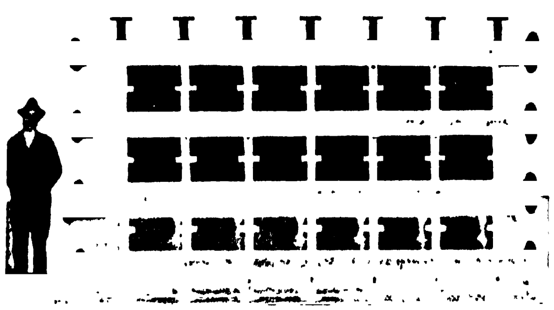
WELDED EQUIPMENT

ave a department especially devoted to the g of welded equipment. The superiority of apparatus is recognized by operating engineers with the result that the demand is constantly increasing. The increased length of service of steel welded pipe, headers, manifolds, fittings, etc., wherever high pressures are necessary will result in great economy in process work. Loss of valuable liquors from leaks, danger of explosion under high pressure of non-welded apparatus, etc., should all be considered by engineers when they are designing new installations, or making additions to present equipment

The illustrations shown here are some examples of welded equipment we have built. From the size of some of this work, an idea may be had of our facilities as well as our ability to serve the largest industrial corporations

WELDED HIGH PRESSURE RECEIVER

WELDED HIGH PRESSURE RECEIVER WITH FOUR OPENINGS


MANIFOLDS FOR SPRAY SYSTEM ASSEMBLED TO ILLUSTRATE UNIFORMITY OF EACH UNIT

EXAMPLE OF WELDED PIPE FLANGES

WELDED HEADER ENTIRELY FROM PIPE

PIPE TESTED TO 10,000 LBS PER SQ IN FOR HYDRAULIC WORK

HYDRAULIC PIPING

We design and build in our own shops hydraulic power piping, for industrial operations in metallurgical plants, rubber factories, cottonseed and other vegetable oil plants, petroleum refineries, soap works, etc.

All hydraulic piping, flanges and fittings are tested by us before shipment.

STEEL WELDED PIPE AND APPARATUS IN THE CHEMICAL INDUSTRIES

Piping systems, whether for steam, water, or other liquids or gases, should be given the greatest possible consideration in the design of a large industrial chemical plant.

Usually it is advisable to intrust this work to a concern making a specialty of it and capable of co-operating with the chemical engineers in general charge of the proposition in an intelligent and useful manner.

Our experience is such that we are not only able to fabricate anything that may be required in this line, but also to make useful suggestions.

Engineers contemplating new installations, or additions or alterations to present equipment, should consult us on their piping problems, process pipe lines, and high pressure equipment, as the experience of our organization of engineers and designers is at their service.

VAN STONE CROSS-OVER BEND AND HEADER

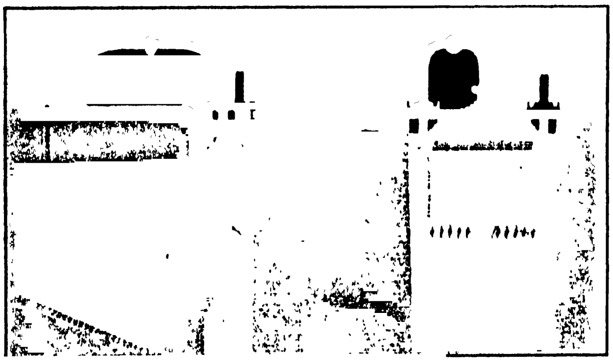
POWER SPECIALTY COMPANY

Manufacturers of Foster Superheaters for Steam, Air, Oil and Chemical Gases

111 BROADWAY, NEW YORK, N. Y.

CHICAGO	BOSTON	PHILADELPHIA	PITTSBURGH	SAN FRANCISCO
Harris Trust Building	50 Congress Street	Land Title Building	Park Building	Balboa Building

PRODUCTS: Superheaters designed for installation in any type of Water Tube or Fire Tube Boiler; also Direct Fired Superheaters in all sizes for Special High Temperature Work; Portable Superheaters for Laboratories, Oil Heaters, Air Heaters and Special Equipment for Heating Various Gases.



FOSTER SUPERHEATER IN HORIZONTAL RETURN TUBULAR BOILER

Installation may be made in old or new boilers and steam connections arranged for either side. The superheater is suspended from overhead supports resting on the walls of the setting.

SPECIAL PROCESS WORK:

Superheated steam is used successfully at the present time in many chemical processes, among which might be mentioned: Petroleum distillation; the refining of cotton seed oil; glycerine stills, sulphite, soda and sulphate digesters in paper pulp manufacture; sulphuric acid plants; water gas plants; soap works; aniline and color works; paint works; manufacture of butter substitutes and many others.

SOME USERS:

Among some of the well known companies using our equipment might be mentioned:

General Chemical Co.	E. I. DuPont de Nemours & Co.
Semet Solvay Co.	Armour & Company
National Aniline & Chemical Co.	Dow Chemical Co.
Benzol Products Co.	Swift & Company
Schoelkopf Aniline & Chemical Co.	Nucoa Butter Co.
Sherwin-Williams Co.	North American Chemical & Co.
Calco Chemical Co.	Merrimac Chemical Co

SPECIAL ENGINEERING SERVICE:

The wide experience our Company has had in the development of superheaters and all kinds of special heating apparatus for chemical uses offers unusual advantages to any one interested in solving problems of this kind, and the services of our engineering department are always available to companies desiring special information. Very often experience gained in some kindred industry may indicate the best manner in which to solve a new problem.

RESEARCH WORK:

The Foster Portable superheater is especially valuable for use in the development of new processes or the improvement of existing methods. Superheaters of this type designed to heat steam, oil, air or other gases are built in a number of convenient sizes for laboratory use.

FOSTER PORTABLE SUPERHEATER FOR STEAM, AIR OR GASES

Suitable for experimental purposes or field work. Extensively used for heating air used in drilling or hoisting and may be fired with oil, coal, coke or gas.

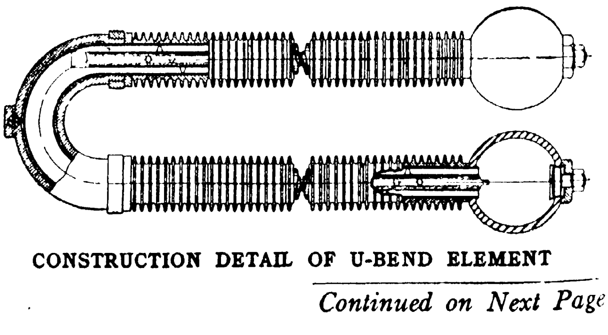
STANDARD SIZES OF PORTABLES

Size	Weight Lbs	Price	Width	Height	Steam Pipe	Smoke Pipe
16	1950		2′—9″	3′—9″	3″	7″
48	3860		3′—8″	5′—0″	4″	10″
72	4720		3′—8″	5′—7″	4″	10″

	Air Heating Capacity in Cubic Feet per Minute		Steam Superheating Capacity in lbs per hr at 100 lb Gauge	
Size	60° F. to 160° F.	60° F to 260° F	100° Superheat	200° Superheat
16	660	325	700	380
48	2000	950	2100	1140
72	3000	1400	3150	1710

DESCRIPTION:

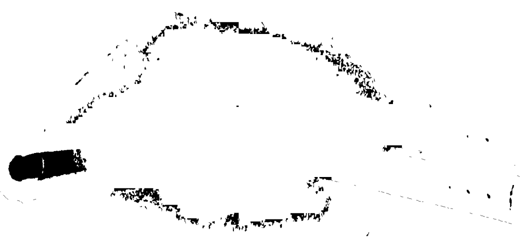
The heating surface of all types of Foster superheaters is formed of cold drawn seamless tubing, the outside surface of which is completely covered with a



CONSTRUCTION DETAIL OF U-BEND ELEMENT

Continued on Next Page

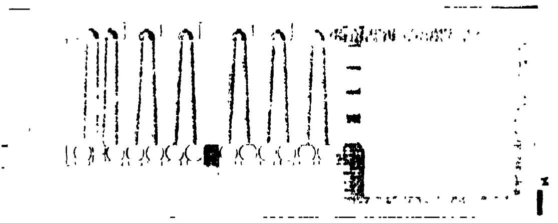
of cast iron rings, tightly fitted to the steel tube, the cast iron surface forming an extended surface for collection and storage of heat and at the same time protecting the steel tubes from direct contact with the hot gases. The tubes or elements are expanded into wrought steel manifolds or headers. An inner tube or core is centered within the straight portion of each superheater tube, thus forcing the steam to flow through the annular space as a film directly in contact with the hot outside heating surface. Hand hold plugs are located opposite every tube end, giving direct access to every expanded joint and the interior of the superheater.



METHOD OF ASSEMBLING U-BEND ELEMENT AND CONNECTING HEADERS

ATTACHED SUPERHEATERS:

The Foster Superheater is designed for erection within the setting of any of the standard types of water tube or fire tube boilers. Such installations require practically no changes in the setting of the boilers and therefore can be applied in any existing boiler without difficulty as well as to new installations. When installed within the boiler any degree of superheat, up to 200° Fahrenheit, can be obtained and the superheat will be practically constant on boiler loads from full load rating to any overload, rising slightly on overloads. When the boiler runs at less than full load rating the superheat will fall off, somewhat.



FOSTER SEPARATELY FIRED SUPERHEATER

The furnace may be arranged for fuel oil, coal or gas. High pressure or exhaust steam, air, petroleum, sulphurous oxide, etc., may be heated to any temperature up to 1000° F.

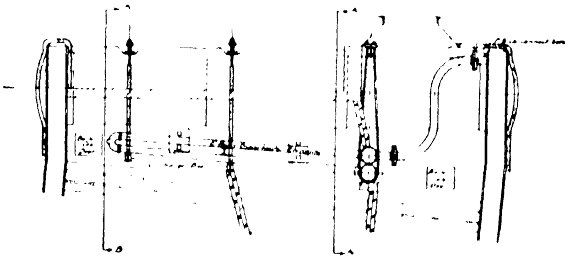
On processes where very constant temperatures are required or a regulation of temperature at various times during a process or when very high temperatures are desired the direct fired type of superheater, installed in brick setting independent of the boilers, is most desirable.

DIRECT FIRED SUPERHEATERS:

Foster superheaters of this type are designed for installation in brick setting arranged for firing with coal, oil or gas fuel or with waste heat from various processes.

Such superheaters can be designed to give any desired temperature to steam at any pressure and operated so that any degree of superheat up to the maximum for which the superheater is designed may be obtained. This is very desirable in many chemical plant installations where different temperatures may be desired at different times during a process.

Foster superheaters of this type are designed to raise steam to any temperature up to 850 to 950° Fahrenheit. Even higher temperature may be obtained if necessary.



FOSTER SUPERHEATER INSTALLED IN WATER TUBE BOILER

AIR, OIL AND GAS HEATERS:

Heaters for these purposes are built similar to steam superheaters of the direct fired type using the Foster patented protected type of elements. Special equipment of this type has been developed for use in many chemical processes requiring higher temperature effects than are possible with saturated steam and where high pressure steam is undesirable or dangerous to use. Many developments of this kind are possible as a means of doing away with the use of direct firing of kettles or tanks where the fire risk is considerable.

SUPERHEATED STEAM IN POWER PLANTS:

The advantages due to the use of superheat for engines, turbines, and pumps in the power plant are thoroughly appreciated, the use of superheat being almost universal at the present time. Material savings of steam and fuel may be thus obtained by the use of a moderate degree of superheat.

LITERATURE:

Our catalog describing the construction of the Foster superheater in detail will be sent on request, and information regarding any special equipment will be supplied by any of our offices.

THE POWERS REGULATOR CO.

965 Architects Bldg.
NEW YORK

2726 Greenview Ave.
CHICAGO

576 Boston Wharf Bldg.
BOSTON

The Canadian Powers Regulator Co., Ltd., Toronto, Ont.

PRODUCTS

Temperature Controlling Specialties and Appliances for the Automatic Regulation of Heating and Cooling Mediums of all kinds, and for general purposes.

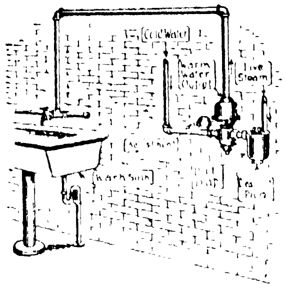
The possibilities in automatic temperature control should be carefully studied. Increasing production costs necessitate close scrutiny of operating conditions. Powers Regulators will eliminate unseen daily losses that make an astonishing total.

Absolute reliability is of paramount importance in this work. The adoption of Powers equipment by the leaders of American industry (see appended partial list of users) is strong indication of the prestige that our apparatus has acquired. The regulators illustrated on this page are but a part of the extensive Powers Line, and the "Users" but a small fraction of our complete list of customers.

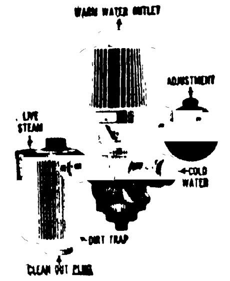
SOME USERS

Hendee Mfg Co, Springfield, Mass
Crane Co, Chicago
Cleveland Telephone Co, Cleveland
Dodge Bros, Detroit
Holtzer Cabot Electric Co, Roxbury, Mass
Selig Polyscope Co, Chicago
American Tobacco Co, Chicago
Curtis Door & Sash Co Chicago
Orinoka Mills, Philadelphia
American Rubber Co, East Cambridge, Mass
B Heller & Co, Chicago
Wyman Gordon Co, Worcestor, Mass.
DeLaval Separator Co, Poughkeepsie, N Y
Upson Nut Co, Cleveland
Timken Detroit Axle Co, Detroit
Aberthaw Construction Co, Boston
Julius Kayser & Co, Brooklyn, N Y
Willys Overland Co, Toledo
Chicago Telephone Co, Chicago
Boston Woven Hose & Rubber Co, East Cambridge, Mass
B F. Goodrich Co, Akron, Ohio
New Departure Mfg Co, Bristol, Conn
Eastman Kodak Co, Rochester, N Y
Geo. E. Keith Co, Brockton, Mass.
Morgan Construction Co, Worcester, Mass.
J P Prescott & Sons, Webster, Mass
Independent Brewing Ass'n, Chicago
Livingston Baking Co, Chicago
S A Maxwell Co, Chicago
Reid Murdock & Co, Chicago
Goodyear Tire & Rubber Co, Akron, O
Firestone Tire & Rubber Co, Akron, O
National Artificial Silk Co, Cleveland
Boston Woven Hose & Rubber Co, Cambridge, Mass
Winchester Repeating Arms Co, New Haven, Conn
Eli Lilly & Co, Indianapolis
Edison Electric Co, Orange, N J
Walter Baker & Co, Newton, Mass
Hallett & Davis Piano Co, Neponset, Mass
Sears Roebuck & Co, Chicago
Harbinson Walker Refractories Co, Chester, Pa
Robinson Clay Products Co, Parral, O
Fisk Rubber Co, Chicopee Falls
New England Westinghouse Co, Springfield, Mass
Keystone Leather Co, Camden, N J
Wilmington Leather Co, Wilmington, Del
National Calfskin Co, Lawrence, Mass
Pierce Arrow Motor Car Co, Buffalo
Brunswick Balke Collender Co, Muskegon, Mich
Lyon & Healy, Chicago
Faultless Rubber Co, Ashland, O
Barney & Smith Car Co, Dayton, O
U S Rubber Co, Hartford, Conn
E I DuPont DeNemours & Co, Wilmington, Del
Greiss Pfleger Co, Chicago
Wilder Tanning Co, Waukegan, Ill
Benzol Products Co, Marcus Hook, Pa

THERMOSTATIC STEAM AND WATER MIXER



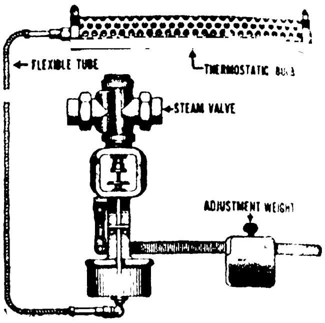
TYPICAL INSTALLATION IN WORKMEN'S WASH SINKS



POWERS THERMOSTATIC MIXER

For workmen's wash sinks, etc., in factories, mines, industrial plants. Safe against scalding. Insures properly heated water for workmen's washup at minimum cost for equipment and operation. Ask for Bulletin 137.

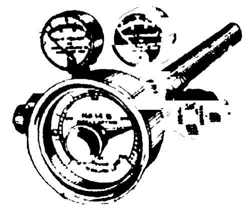
AIR TEMPERATURE CONTROL



POWERS REGULATOR NO 15

For dry kilns, warming ovens, cooling rooms, dry rooms, varnish rooms, etc., our No. 15 Regulator gives dependable uniformity of temperature. Entirely self-contained, and adapted to a great variety of processes.

Personal attention is unreliable and expensive, and should be replaced by Automatic Thermostatic Regulation wherever possible. Ask for Bulletin 138.

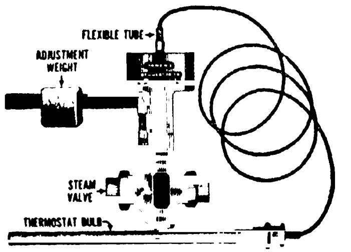


POWERS REGULATOR NO. 14B

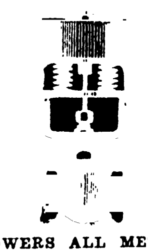
Our No. 14B Regulator is of the compressed air operated type—very sensitive and effective. Used in air conditioning and for control of sterilizers, ovens, dryers, cold storage rooms, etc.

With this may be used our all-metal diaphragm mounted valves adapted to the control of steam, gas, or liquids. Ask for Bulletin 132.

LIQUID TEMPERATURE CONTROL



POWERS REGULATOR NO. 11

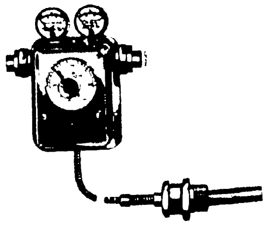


POWERS ALL METAL MOUNTED VALVE

Our No. 11 is highly effective for the control of temperatures of liquids in tanks, kettles, vats, etc. Especially practical in those industries which involve washing and dyeing processes, bleaching equipment, cookers, acid baths, chemical treatments, etc., etc.

Entirely self-contained, requiring no air or water pressure for its operation. Ask for Bulletin 129.

Our No. 21 is a compressed air operated regulator with flexible extension bulb, for use with diaphragm valves and motors, to control heating and cooling mediums. Particularly effective where gas is the heating medium. Its wide range (0° to 1000° F.) adapts it especially to core ovens, soft metal furnaces, etc. Ask for Bulletin 147.



POWERS REGULATOR NO. 21

POWHATAN MINING COMPANY

Cable Address "POWMINCO"

WOODLAWN, BALTIMORE, MD.

PRODUCTS

Powminco Asbestos

Trade-Mark

USES

Technical

Laboratory

Filtration

Commercial

Filtering Acids, Chemicals, etc.

Platinizing Asbestos as used in the contact process of a sulphuric acid plant.

PURE ACTINOLITE ASBESTOS FIBRE

POWMINCO ASBESTOS

Powminco Asbestos is fibreized; free from gangue, incompletely shredded mineral and other impurities.

We can furnish most any length of fibre for special laboratory purposes; packing combustion tubes, trains, etc.

Powminco Asbestos has been adapted to many special uses, outside its regular field. Submit us your problems, we may be able to adapt **Powminco** to your particular requirement.

SAMPLES

Our Technical Department will be very glad to submit samples, prices, together with descriptive literature, under no obligation whatsoever.

SERVICES

No obligation. Our Testing Laboratory will be glad to experiment in order to determine our product's availability for any specified use. Write our Experimental Laboratory regarding your particular problem.

PRECISION INSTRUMENT COMPANY

Recording and Indicating Instruments for Power and Gas Plants

FACTORY AND MAIN OFFICE
21 Halsey Street
NEWARK, N. J.
BRANCH OFFICE Detroit, Mich

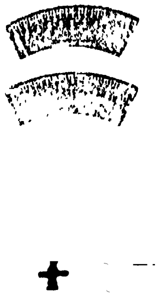
PRODUCTS

Indicating and Recording Gauges for Vacuum and Pressure, with scales in inches, pounds and millimeters of water, mercury and kerosene; Combined Recording and Indicating Gauges; Differential Draft Gauges; Hydro-Gauges; Automatic CO_2 Recorders, SO_2 Recorders; Hand Orsats or Flue Gas Analyzers; Coal Calorimeters; Micrometer Level Gauges; Recording Gas Calographs; Specific Gravity Recorders; Laboratory Test Meters.

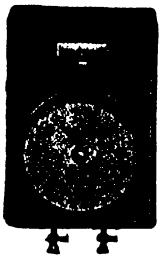
Also manufacturers of Gas Collectors; Pitot Tubes; Venturi Tubes; Chemical Glassware.

GAUGES

Precision 2-in-1 Gauges—For use in natural draft boilers, showing the draft in the combustion chamber and the last pass or any other points of draft desired. Furnished in indicating or 24-hour recording types, in any range to meet requirements. Patented.



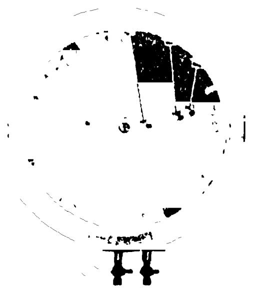
PRECISION 2-IN-1 INDICATING GAUGE



PRECISION 2-IN-1 RECORDING GAUGE

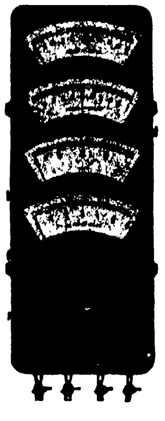
Precision 3-in-1 Gauges—For use with stokers with forced draft and are installed to enable the operating man to see at a glance the three vital points of draft in a boiler. Furnished in indicating or 24-hour recording types. Patented.

PRECISION 3-IN-1 INDICATING GAUGE



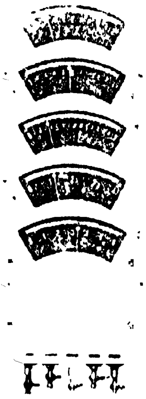
PRECISION 3-IN-1 RECORDING GAUGE

Precision 4-in-1 Gauges—For use in installations where an economizer is installed or with stokers having 2 compartments below the grates. All ranges to meet requirements. Patented.



PRECISION 4-IN-1 INDICATING GAUGE

Precision 5-in-1 Gauges—For indicating the drafts in boilers where Cox or Harrington stokers are installed, enabling the fireman to read pressure and drafts at every part of the boiler. Dead beat construction under Precision patents.



PRECISION 5 IN 1 INDICATING GAUGE

Precision 60-day Tape Gauges—Supplied in ranges from 2-in. vacuum to any desired pressure. Dead beat construction. Used to record drafts at the boiler or steam pressure.

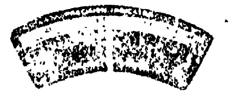
PRECISION 60-DAY TAPE GAUGE

Precision Single Indicating Gauges—For indicating vacuums or pressures. Rugged in construction and of the well-known Precision dead beat type.

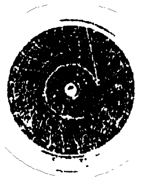
Supplied in inches, pounds and millimeters of water, mercury or kerosene.

Precision Hydro-Gauges—For gas plants are guaranteed accurate and reliable.

For recording pressure in gas plants, coke ovens, etc. Guaranteed accurate and reliable. Supplied as above in water, mercury or kerosene.



PRECISION SINGLE GAUGE



PRECISION 24-HOUR RECORDING GAUGE

Precision 24-hour Recording Gauges—Guaranteed accurate. Dead beat construction. Ranges, 1 in. to 500 lbs. vacuum and pressure. In feet head for liquid levels. For coke oven use, can be supplied in millimeters of kerosene.

Continued on Next Page

CO_2 RECORDERS

Automatically analyze flue gases and record on a 24-hour or 60-day chart. True orsat in principle. Reagent used is potassium hydroxide.

Simple in construction, accurate to .5 of 1% CO_2. Standard range, 0 to 20% CO_2. Also supplied in 0 to 10% for producer gas; 0 to 50% for blast furnaces and lime and cement kilns; 65% to 100% for soda ash manufacturers

CO RECORDER

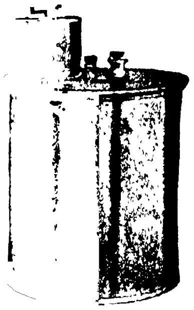
SO_2 RECORDERS

Of the same general principle as CO_2 recorders, but adapted to analyze sulphur dioxide

PRECISION 100 CC STANDARD ORSAT

STANDARD ORSATS

Orsats in 1, 2, 3 and 4 tubes Burettes graduated for 50 cc or 100 cc. All metal and glass construction. Analyze for CO_2, CO, O and H. Orsats for other readings can be supplied to specifications.



PRECISION COAL CALORIMETER

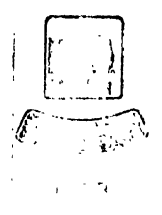
COAL CALORIMETERS

This company has been identified with the manufacture and sale of coal calorimeters for a number of years, and has developed simple and reliable patented instruments for determining the heating value of coal.

These instruments afford coal buyers the financial advantage of buying coal on a heating value basis from tests of coal offered for sale.

COMBINED INDICATING AND RECORDING GAUGES

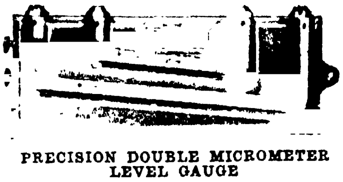
Give the indication at a glance, also the permanent record of the condition on a 60-day tape chart. Made for either vacuum or pressure, direct reading or differential. Supplied with rewinding device for used chart, if desired. Case is of all-metal construction, black enamel. Bronze front furnished at extra cost.



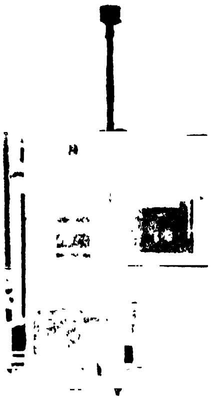
COMBINED INDICATING AND RECORDING GAUGE

MICROMETER LEVEL GAUGES (SINGLE AND DOUBLE)

Combine rapid and accurate calibration with low maintenance and minimum chance of breakage Absolutely no strain placed on the glass. Connection between glass and metal is through a simple seal.



PRECISION DOUBLE MICROMETER LEVEL GAUGE



RECORDING CALORGRAPHS

For recording on a 60-day chart the British thermal units of artificial, natural or producer gas. Automatically compensate for variations in temperature, specific gravity and pressure.

Accurate and reliable. Simple in construction and give permanent record.

PRECISION RECORDING CALORGRAPH

SPECIFIC GRAVITY RECORDERS

These instruments automatically record specific gravity of gases and are applicable for natural gas, producer gas, artificial gas and in the oil and gasoline fields.

They are accurate, simple and reliable.

24-hour disc or tape types.

PRECISION SPECIFIC GRAVITY RECORDER

LABORATORY TEST METER

LABORATORY TEST METERS

Made in one general type as illustrated, with all brass construction to resist corrosion. Capacity, $^1/_{10}$ of 1 cu. ft. per revolution Read fractional quantities direct.

New features. Send for bulletin.

SOME USERS OF PRECISION GAUGES

Alabama Power Co , Benoit, Ala
American Gas & Electric Co , Wellsburg, W Va
American Railways Co , Philadelphia, Pa
American Smelting & Refining Co , Maurer, N J
Baltimore & Ohio Railroad, Baltimore, Md
Barrett Company, New York, N Y
Benzol Products Co , Marcus Hook, Pa
B F Goodrich Co , Akron, Ohio
Brunner, Mond Canada, Ltd , Amhurstburg Canada
B T Babbitt Co , New York, N Y
Canadian Salt Company, Windsor, Ontario
Columbia Chemical Co , Barberton, Ohio
Connecticut Light & Power Co , Waterbury, Conn
Consolidated Gas & Electric Light & Power Co , Baltimore, Md
Diamond Alkali Co , Painesville, Ohio
Edison Electric Illuminating Co , Boston, Mass
Endicott, Johnson Co , Endicott, N Y
General Chemical Company, New York, N Y
Grasselli Chemical Co , Cleveland, Ohio
Huron Portland Cement Co , Detroit, Mich
Interborough Rapid Transit Co , New York, N Y
Lehigh Valley Transit Co , Allentown, Pa
Linde Air Products Co , New York, N Y
Little Rock Railway & Electric Co , Little Rock, Ark
Louisville Gas & Electric Co , Louisville Ky
Metropolitan By-Products Co , New York, N Y
Midvale Steel Co , Norristown, Pa
Minneapolis General Electric Co , Minneapolis, Minn
National Lamp Works, Cleveland, Ohio
National Tube Co , Lorain, Ohio
North American Chemical Co , Bay City, Mich
Pennsylvania Salt Mfg Co , Wyandotte Mich
Pittsburgh & West Virginia Railways, Pittsburgh Pa
Procter & Gambel Co , Cincinnati, Ohio
Raritan Copper Works, Perth Amboy, N J
Republic Rubber Co , Akron, Ohio
Solvay Process Co , Detroit, Mich , and Syracuse, N Y
Tennessee Coal & Iron Co , Birmingham, Ala
Union Electric Light & Power Co , St Louis, Mo
United Gas & Electric Corp , New York, N Y
Viscose Company, Marcus Hook, Pa , Norfolk, Va
West Penn Traction Co , Connellsville, Pa
Whitall Tatum Co , Millville, N. J.

PRECISION THERMOMETER & INSTRUMENT CO.

1434 BRANDYWINE STREET, PHILADELPHIA, PA.

PRODUCTS

Thermometers, for Laboratory, Factory and Power Plants; Hydrometers; Hygrometers; Barometers; Automatic Regulators; Meteorological Instruments; Vacuum Gauges; Precision Instrument Work—special and experimental; Calender-Micrometers; Ballistic Instruments.

INSTRUMENT MAKING

We are manufacturers equipped for small machine work, precision instrument work—special and experimental. On receipt of specifications or drawing covering instruments of special design, information with reference to prices and deliveries will be promptly furnished. Our service to the Government during the War in the line of Precision Instrument making covered a wide range of endeavor, from gun parts and ballistic instruments to the finest powder dies.

BALLISTIC INSTRUMENTS

"Precision" LeBoulengé Chronograph of improved design, as adopted in 1917 by U. S. Government and the largest powder manufacturers. Complete units furnished. Velocimeters, Drop Test Machines, etc.

AUTOMATIC REGULATORS

Electrical for heavy duty. D.C. up to 110 volts. Direct connected valve.

LOW TEMPERATURE THERMOMETERS

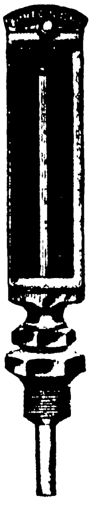
Special Chemical Thermometers reading to —100°C. filled with toluol, and to —200°C. filled with pentane. Made in Philadelphia. Tested at —190°C.

CALENDER MICROMETERS

Indicating and recording, for use on calendering machines to indicate the thickness of paper, linoleum, etc. (Each scale division is equivalent to 1/1000 inch.) Write for Bulletin "M."

PRECISION THERMOMETERS

Armored
Asphalt Testing
Bakers
Bake Oven
Brass Case
Brine Pipe
Calorimeter
Cellar
Chemical
Cold Storage
Cold Test
Confectioners
Copper Case
Distillers
Dough Testing
Electric Alarm
Engineers
Glass Angle
Glass Straight
Iron Angle
Iron Straight
Japanning Oven
Kettle
Laboratory
Marine
Mash Tub
Mash Pipe
Maximum
Maximum and Minimum
Oil
Oven
Pasteurizer
Pipe Straight
Pipe Angle
Pocket
Precision
Railway
Recording
Registering
Ship Hold
Sixe's Registering
Sterilizing
Sugar
Tin Case Standard
Titer Test
Vulcanizing
Weather Bureau



THERMOMETER

In Sets for the Soap and Fat Laboratory.

In Sets, especially arranged in gradation of series for the dye industry Laboratories.

Laboratory Standards with Certificates by the Bureau of Standards. See Bulletin "C."

ANEMOMETERS

Biram's Type, with improved zero setting de for Measuring Air Currents in Shafts, Ducts, etc

BAROMETERS

Mercurial Standard, U. S. Signal Corps type, as made by us for the United States Government See Bulletin "C."

HYGROMETERS

United States Weather Bureau type. Wet and dry bulb hygrometers for the accurate determination of relative humidity.

VACUUM GAUGES

Full column mercurial gauges with trap.

DRAFT GAUGES

Siphon type for Water or Mercury.

CLINOMETERS

For Mariners and Aviators.

SPECIAL APPARATUS

For Laboratory and Chemical Works.

HYDROMETERS

Plain and combination standard grades only, with individually calibrated hand written scales.

The forms most in demand for Laboratory and Factory Use are in stock for prompt delivery.

Hydrometers in Standard Sets. See Bulletin "C."

TACHOMETERS

Special Service in repairing, adjusting and Calibrating Centrifugal Tachometers.

SERVICE

If you have a Temperature Problem in connection with your process we solicit your correspondence, and an opportunity to help you solve it. The peculiar and interesting experiences that we have had in this field of endeavor read almost like an Industrial Romance "Where a condition of Heat is used to produce a Result" it is axiomatic that you can not control the result without first controlling the heat, and heat-control begins with temperature measurement. Armed with this AX(iom) we have invaded the premises of numerous "Processes" with results that have frequently been a revelation to the manufacturers, as well as a pleasure to us. We could tell interesting Histories about Distilling Turpentine, Mercerizing Yarn, Dyeing Hats, Vulcanizing Fiber and many other things where the Key to the Situation lay in the specially adapted Thermometer.

LITERATURE

Circulars and a general catalog describing, listing and illustrating these instruments are published by us for free distribution upon request. The above, however, is but a partial list of our products since we construct many instruments to meet the particular requirements of our customers.

Long Stem Glass Thermometers with enclosed scales, for Chemical Plants. See Bulletins "C" and "E"

PRESSED STEEL TANK COMPANY

Manufacturers of Seamless Bilged Barrels, Seamless Pressure Tanks,
Hackney Drums

[illegible] SALES OFFICE
[illegible] Salle Street, Chicago

GENERAL OFFICE AND WORKS
MILWAUKEE, WIS.

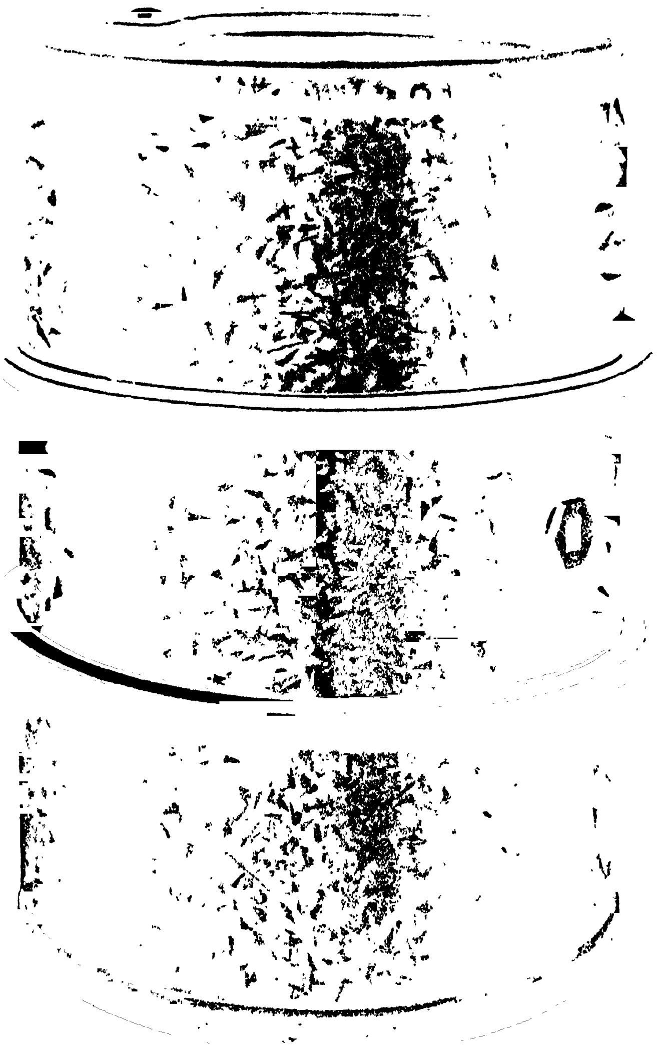
NEW YORK OFFICE
Woolworth Building

PRODUCTS

- **Seamless Bilged Barrels.**
- **Seamless Pressure Tanks.**
- **Hackney Drums.**

SCOPE

We are the largest manufacturers of steel containers for the shipment of liquids and semi-liquids. Write our nearest office for catalog and prices.



HACKNEY DRUM

Hackney
MILWAUKEE
Trade Mark

HACKNEY 110 GALLON STEEL DRUMS

Made of 14 gauge steel and galvanized by hot dipping after they are made up. These drums are equipped with I Bar rolling hoops or U hoops, as desired. They comply with I. C. C. specifications No. 5.

HACKNEY TWO PIECE DRUMS

Made of seamless drawn steel, 55 and 110 gallon capacity, in black or galvanized, complying with I. C. C. specifications No. 5A, for the shipment of acids and other dangerous articles.

HACKNEY REMOVABLE HEAD STEEL BARRELS

30 and 50 gallon capacity, made of seamless drawn steel, plain or galvanized, with a removable head that can be detached by unfastening one bolt. This is one of the best containers on the market for the shipment of semi-fluid products.

HACKNEY SEAMLESS BILGED BARRELS

33 gallon and 55 gallon capacity, made of seamless drawn steel in black or galvanized, complying with I. C. C. specifications No. 5 and No. 5A, recommended for shipment of gasoline or other dangerous liquids.

HACKNEY 55 GALLON STEEL DRUMS

Made of 16 gauge steel, hoops rolled in the shell, or equipped with U hoops or I Bar hoops, both openings in one head, or opening between hoops when desired.

W. E. PRINDLE COMPANY

Manufacturers of Dryers for the Chemical and Allied Industries
COLUMBUS, OHIO.

PRODUCTS

Direct, Indirect and Steam Heated Dryers.

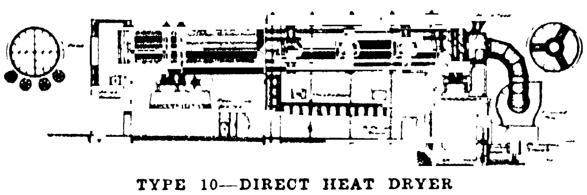
DESIGN AND CONSTRUCTION

The Prindle Dryers embody many highly desirable features essential to the class of production for which our Dryers are suitable which are not found in the design of any competitive machines. These features are broadly covered by Letters Patent, are distinctly original and have an important bearing on the capacity and high efficiency of the Dryers. The application of the drying agent, whether it be Direct Heat, Indirect Heat, or Steam Heated Air, has been worked out so as to give the very best results.

Experience gained from Fifteen Years' Designing and Manufacturing over one hundred successful installations is the best guarantee that our customers will get equipment which will give them satisfactory results. Our long experience gained from designing, installing and instructing operators in the use of our dryers is at the service of new purchasers.

TYPE 10 DRYER

Type 10 is a direct dryer, suitable for drying high grades of tankage, pressed blood, fish scrap, garbage, glucose feed, coal, etc.



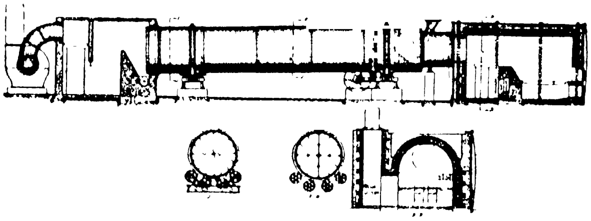
TYPE 10—DIRECT HEAT DRYER

Standard Sizes

No 50	Cylinder 50"x30' 0"	No 70	Cylinder 70"x42' 0"
No 55	Cylinder 55"x33' 0"	No 80	Cylinder 80"x48' 0"
No. 60	Cylinder 60"x36' 0"	No. 90	Cylinder 90"x54' 0"
No 65	Cylinder 65"x39' 0"		

TYPE 12 DRYER, PARALLEL CURRENT

This Dryer is suitable for removing moisture from materials carrying a high percentage of water. The gases as they come from the Furnace are of such high temperature that, if permitted to enter the dryer, would instantly dry and burn up the finer particles of the material being dried, besides being very injurious to the Cylinder. To overcome these objections, the proper amount of fresh air is introduced through the bridge wall. This air mixes with the furnace gases, reducing the temperature to a point where they will not exceed 600 or 700° Fahrenheit when they enter the dryer.



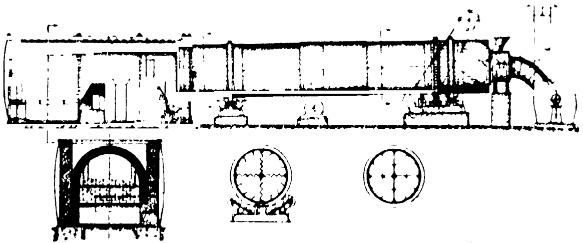
TYPE 12—PARALLEL CURRENT DRYER

Standard Sizes

No 50	Cylinder 50"x30' 0"	No. 70	Cylinder 70"x50' 0"
No. 55	Cylinder 55"x35' 0"	No 80	Cylinder 80"x55' 0"
No 60	Cylinder 60"x40' 0"	No. 90	Cylinder 90"x60' 0"
No. 65	Cylinder 65"x45' 0"		

TYPE 11 DIRECT HEAT DRYER, COUNTER CURRENT TYPE

This type has the furnace at the discharge end of the cylinder, and with the exhaust fan set at the feed end and close coupled. This machine allows for installation in a limited space. This dryer is used for drying high grades of salt, sand, minerals, or any class of material which is to be dried to a point where there remains but a fraction of 1% of moisture, and where the material will not be injured by coming into contact with fairly high temperature in its dry state. This Dryer is absolutely without a rival.



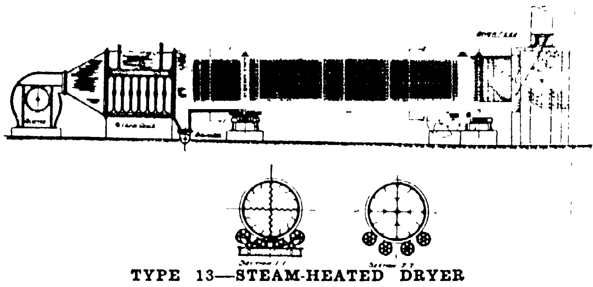
TYPE 11—COUNTER-CURRENT DRYER

Standard Sizes

No 50	Cylinder 50"x25' 0"	No 70	Cylinder 70"x35' 0"
No 55	Cylinder 55"x27' 0"	No 80.	Cylinder 80"x40' 0"
No 60	Cylinder 60"x30' 0"	No 90	Cylinder 90"x45' 0"
No 65.	Cylinder 65"x32' 0"		

TYPE 13 DRYER, STEAM HEATED

This is the same type Cylinder as described as No 11, excepting that instead of having a furnace we have a bank of steam coils placed at the discharge end of the Dryer through which the air from the blower fan passes before entering the Dryer. This is the Counter Current Type. This Dryer is suitable for removing the moisture from high grade chemicals, wood chips, butter and cheese, salt, sugar, stock feeds and in fact all sensitive materials requiring a low temperature, or materials which will not permit of passing the products of combustion through the Dryer.



TYPE 13—STEAM-HEATED DRYER

Standard Sizes

No 50	Cylinder 50"x25' 0"	No 70	Cylinder 70"x35' 0"
No. 55	Cylinder 55"x27' 0"	No 80	Cylinder 80"x40' 0"
No. 60	Cylinder 60"x30' 0"	No 90	Cylinder 90"x45' 0"
No. 65	Cylinder 65"x32' 0"		

GUARANTEE

Fire Dryers operating on Garbage, Stock Feeds, Fertilizers, Glucose Feeds, etc., which materials carry a moisture content seldom below 40%, are Guaranteed to show an evaporation of not less than 10 pounds of water per pound of combustible consumed in the furnace of the Dryer, based on a grade of slack Bituminous coal containing not less than 13,000 B. T. U per pound as fired.

PROCTOR & SCHWARTZ, INC.

FORMERLY THE PHILADELPHIA TEXTILE MACHINERY CO
PHILADELPHIA, PA.

Proctor DRYERS
Trade Mark

Cable Address
PROCTOR " Philadelphia

BRANCH OFFICES
Chicago, Ill   New York, N Y   Charlotte, N C   Providence, R I   Hamilton, Ont, Canada

PRODUCTS

"Proctor" Dryers—**built in cabinet tray and truck tray types, in various sizes and capacities, for drying Chemicals, Pharmaceuticals, Paint Colors, Aniline Dyes, Colors for Printers' Inks, Lithopone, White Lead, Paris Green, Ceramics, etc.**

DESCRIPTION

The "Proctor" Dryer consists essentially of a metal enclosure, containing steam coils and fans suitably arranged about a space in which the wet material is placed on trays, either on racks or on trucks. The air within the enclosure, heated by means of the steam coils, is circulated across the trays in great volume by the large fans, drying the material in minimum time.

"PROCTOR" SYSTEM OF RECIRCULATION

The various types of "Proctor" Dryers all operate on the principle of recirculating the heated air, a feature to which is due a great deal of the efficiency and economy of these machines. By this system the heated air is used over and over again, passing alternately across the material and through the steam coils. A moderate supply of fresh air is admitted and a corresponding amount of partially saturated air is expelled, constantly. This change of air takes place gradually and in relatively small volume, being so proportioned that the air within the enclosure is maintained at the point of highest drying efficiency. Tempered air only passes through the coils, resulting in a great saving of fuel over methods which take air at outside temperature directly to the coils.

CONSTRUCTION

The "Proctor" Dryer is simply and substantially constructed of the most practical and durable materials throughout. Being built entirely of metal, it is fire-proof. All parts are accessible from the outside, the sides being closed in by removable panels clamped by wing nuts. These panels are made of two sheets of metal with air-cell asbestos between. They are tight-fitting and non-conductive, effectively preventing loss of air and heat. The steam coils are assembled and tested under 175 lbs. pressure before leaving our shops, to insure their being tight and perfect. The fans are of the disc type, made of iron and steel. They are of large diameter and move a tremendous volume of air but consume very little power because they operate at low speed.

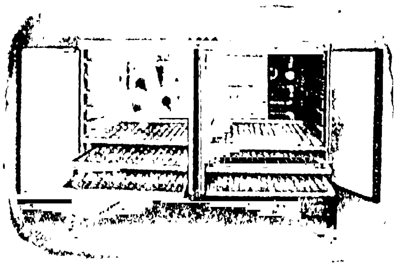
"Proctor" drying is correct in principle, insuring uniform, perfect results, safeguarding the material against case-hardening, baking, scorching, discoloring or other injurious effects of incorrect drying methods.

FLEXIBILITY

"Proctor" Dryers may be increased in size and capacity at any time or they may be taken down and moved from one place to another. Thus they become convertible assets at all times.

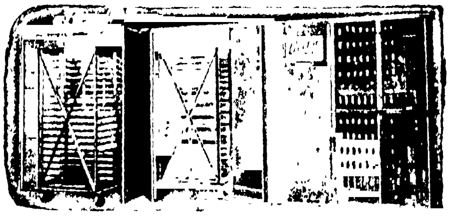
SERVICE OF EXPERIMENT AND INFORMATION

We maintain an Experimental Laboratory in charge of expert drying engineers, who will investigate the drying of any material, submit a report of results and recommend an equipment for satisfactory and economical drying, without cost or obligation to the manufacturer. Illustrated catalogues and pamphlets are glad and freely given to anyone interested



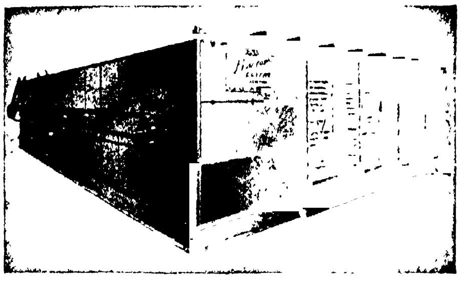
"PROCTOR" DRYER (CABINET TRAY TYPE) FOR ANILINE DYES, PAINT COLORS, CHEMICALS, PHARMACEUTICALS, ETC

Built in various sizes to contain 12 to 60 trays. Smaller sizes widely used for laboratory purposes



"PROCTOR" DRYER (TRUCK TRAY TYPE) FOR PAINT COLORS, ANILINE DYES, COLORS FOR PRINTERS' INK, CHEMICALS, ETC.

In this type of machine the trays of material are placed on trucks. Steam coils are located on both sides and fans between the coils and the truck space. The air is recirculated across the material and through the coils giving quick, uniform drying



"PROCTOR" DRYER (TRUCK TRAY TYPE) FOR LITHOPONE, WHITE LEAD AND SIMILAR MATERIALS

For drying large quantities of material, loaded on trays and carried by trucks through the dryer from feed end to delivery end. Operated in a progressive manner--as each truck of wet material enters the dryer, a truck of dry material comes out at the other end. An automatic device moves the line of trucks ahead. Side fans blow the heated air through the trucks first from one side and then the other, as they move forward.

PROVOST ENGINEERING CORPORATION

50 F Church St., Hudson Terminal
NEW YORK, N. Y.

Telephones
CORTLANDT 54 55 56

WORKS
Provost and Eagle Sts.,
Brooklyn, N. Y.

PRODUCTS

Mixers, Filter Presses, Vacuum Pumps, Acid Pumps, Liquid Pumps, Pressure Blowers, Pulverizing Machinery.

INQUIRIES

When making inquiries it will greatly facilitate matters if our correspondents will give us the information asked for below.

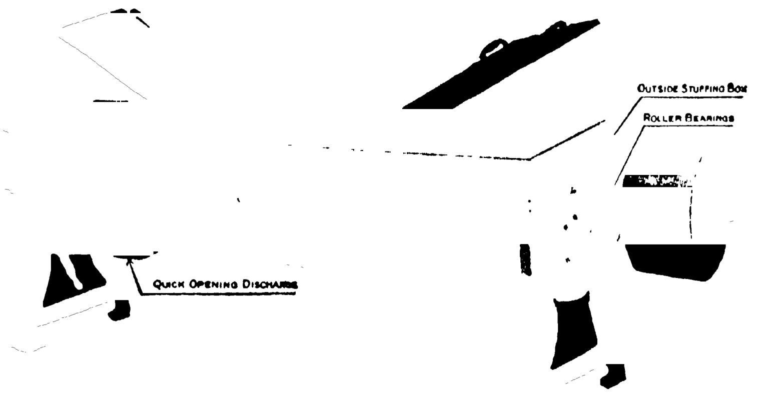
1. Materials to be mixed.
2. Weight per cubic foot.
3. Capacity desired per hour.

"PROVO" MIXER, USES

Wherever thorough and efficient mixing of materials is desired. Particularly adapted for various chemicals, colors, pharmaceutical preparations, fertilizers, etc.

Among users of mixers there has been a growing demand for a machine which would overcome the annoyances experienced in operating the old style mixers. They were hard to clean because the agitator was not removable, the stuffing boxes were difficult to adjust and permitted oil to contaminate the charge of material in the mixer. A great deal of trouble was also experienced on account of the legs or stands breaking.

Based on our many years of experience our Engineers have eliminated all the above troubles and have perfected a mixer known as the Improved "Provo" Mixer.



"PROVO" MIXER

Our standard "Provo" Mixers are built of steel
We also galvanize the steel and equip with gear drive if desired

"PROVO" MIXER, FEATURES

1. **Easily Cleaned**—because the "Provo" Agitator can be removed in a few minutes without disturbing the rest of the machine. On other mixers the agitator is not removable.

2. **Adjustable Stuffing Boxes**—located on outside of heads and not connected with bearings in any way.

3. **Roller Bearings**—located outside of heads and not connected with stuffing boxes, consequently no oil can contaminate the product to be mixed. These bearings also reduce power required.

4. **Extra Heavy Stands or Legs**—These are practically unbreakable.

Most Efficient.

KNEADING MACHINES

We have also placed upon the market a new type of mixer entirely different from any that has yet been produced. This machine is especially adapted for mixing dough or any similar material. Our mixer consists of a large cup-shaped container mounted on a platform which is revolved continuously by a gear and pinion underneath the platform. A long shaft with a wing-shaped propeller projects downward into the container. The whole shaft moves in a peculiar manner in order to stir up every particle of the material in the container. This motion in connection with the revolving of the container assures an absolute thorough mixture. The container is so arranged that it can be automatically tilted for emptying.

This mixer is manufactured in the following standard capacities:

		1	2	3	4	5	6	7
Flour	lbs	55	110	165	220	275	330	440
Dough	..lbs..	90	165	255	330	420	510	660

Due to this mixer being something entirely new, it was impossible to secure photographs or cuts of this machine before the catalog went to press. However, prices and further data will be furnished on request.

TABLE OF SIZES, ETC., OF PROVO MIXER

Size	CAPACITY			MEASUREMENTS			PULLEYS		Horse Power Depending on Material	Shipping Weight
	*Pounds	Gallons	Cu ft	Length	Breadth	Height	Size	Speed R P.M		
No 1	80	21	2 80	4′ 0″	1′ 8″	3′ 4″	12″ x 3	40-50	½-1	230
2	115	30	4 00	4′ 10″	1′ 8″	3′ 4″	15″ x 4	40-50	½-1	375
3	170	45	6 00	6′ 10″	1′ 8″	3′ 1″	15″ x 4	40-50	1 -1½	460
4	210	55	7 33	6′ 0″	2′ 0″	3′ 5″	18″ x 5	35-45	1½-2	660
5	300	80	10 66	7′ 0″	2′ 0″	3′ 5″	20″ x 5	35-45	2 -2½	775
6	380	100	13 33	7′ 3″	2′ 4″	3′ 6″	20″ x 6	30-40	2½-3	940
7	460	120	16 00	8′ 9″	2′ 4″	3′ 6″	20″ x 6	30-40	2½-3	1200

* Pound capacity based on flour. Further information for larger sizes on request.

PULMOSAN SAFETY EQUIPMENT CO.

Manufacturers of

"Pulmosan" Safety Devices

45 WILLOUGHBY STREET, BROOKLYN, N. Y.

Telephone
TRIANGLE 4435

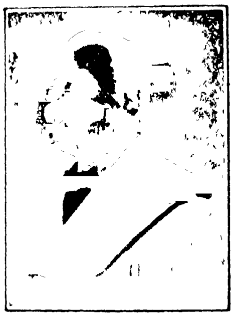
PRODUCTS

A large variety of Safety Devices, in stock, covering all hazards peculiar to the chemical industry.

Respirators for Dust and Fumes
Pure Air Masks and Breathing Devices
Sand Blast Helmets, with or without air supply
Helmets; Pure Air and Welding
Hoods; Acid and Dust
Masks; Acid, Ammonia, Babbitting, Chipping, Face, Furnace and Respirator
Safety Garments, Leggings, Gloves and Goggles
Airtight Goggles
Special Helmets, hoods and respirators made to your individual requirements.

"PULMOSAN" RESPIRATORS

We manufacture many different kinds both for dust only or for dust and light fumes. Each particular kind of a Hazard requires a respirator that is best suited for the purpose. State the conditions in your shop and we will supply your needs promptly from stock. We are specialists in the art of making respirators. Consult us



"PULMOSAN" RESPIRATOR NO 11. "PATENTED"

No. 11 Respirator—Lightest and smallest respirator on the market. It is cool and comfortable. The filter element consists of a combination of fine screening materials, so perfectly supplementing each other as to keep out all dust. Adjustable to fit any head and face. For dust only.

"PULMOSAN" ALUMINUM RESPIRATOR NO. 18

No. 18 Respirator—This type Respirator with the positive exhaust valve, the inflated cushion and the adjustable straps is master of all respirators. Least number of parts, made of spun aluminum, light, comfortable and very efficient. Will positively fit any face and very sanitary.

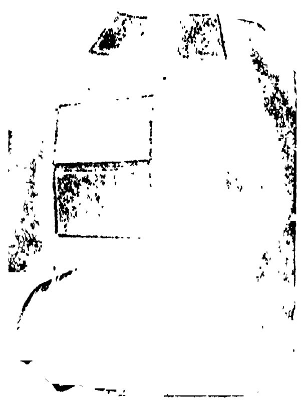
SAFETY MASKS AND HELMETS

We manufacture a complete line of these safety appliances for every known industrial operation. We have protectors for use in atmospheres laden with any kind of fumes, and dust. Each type of protector is made for certain purposes. When writing to us state the conditions surrounding your workmen.

"Pulmosan" Face Mask No. 20—Wherever dust or fumes are of such an irritating nature as to injure the eyes as well as the respiratory tract, we strongly recommend the use of this mask. It eliminates the discomfort caused by wearing respirators and goggles. Glasses will not fog due to chamber arrangement. Hood can be supplied to completely cover the head.

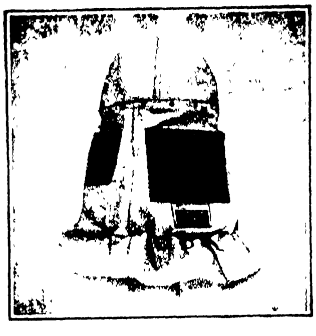
"PULMOSAN" FACE MASK NO. 20

"Pulmosan" Dust Hood No. 31—This hood being made of cotton cloth is very light and has a series of wire cloth passages which allow the air to circulate thruout the helmet and yet keep out the fine particles of dust. One hundred square inches of breathing passages. Light, comfortable and adjustable. Celluloid, Mica or Glass Windows can be furnished.



"PULMOSAN" DUST HOOD NO. 31. "PATENTED"

"Pulmosan" Sand Blast Helmet No. 30—The lightest and most serviceable sand blast helmet known. Made from 10 oz. cotton duck with multiple screens to protect the wearer from the constant blow of sand, yet made so that a continuous flow of air is circulated thruout the helmet at all times. Will fit any head, and outlast any three helmets of any other make.



"PULMOSAN" SAND BLAST HELMET NO. 30. "PATENTED"

DELIVERIES

Safety Devices are always needed in a hurry for immediate use; our stock is such that shipment is generally made the day order is received.

Get acquainted with "Pulmosan" Service.

ILLUSTRATED CATALOG ON REQUEST

PYROLECTRIC INSTRUMENT CO.

Manufacturers of Electrical Precision Instruments
TRENTON, N. J.

ITALY
Henry Coe & Clerici
via Montebello 36, Milan

ENGLAND
Grahame Chemical Co
87 Victoria St Liverpool

JAPAN
Shimadzu Seisakusho, Ltd.,
Nijyo Kawaramachi Kyoto

PRODUCTS

- Ammeters (portable)
- Electro-Dynamometers
- Electrometers
- Galvanometers
- Hypsometers
- Hydrogen-Ion Apparatus and Chemicals
- Inductance, Fixed and Variable Standards
- Keys and Switches
- Lamp and Scale Outfits
- Milliammeters
- Millivoltmeters
- Potential Sets
- Potentiometers
- Pyrometers (indicating)
- Resistance Boxes
- Resistance Standards
- Resistance Thermometers
- Standard Shunts
- Thermocouples
- Thermocouple Calibration Outfits
- Volt Boxes
- Voltmeters (portable)
- Wheatstone Bridges

SERVICES

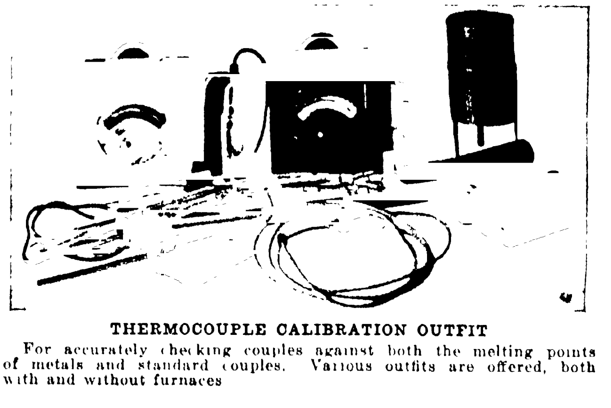
Pyrometer engineering and installations, consultation services and advice regarding uses of electrical precision instruments, careful supervision and construction of special instruments and experimental work on a cost basis, commercialization and marketing on a royalty basis of new and valuable scientific apparatus which is fully developed.

NORTHRUP PYROVOLTER, A GUARANTEED PYROMETER

This pyrometer works on the potentiometer system and is independent of all resistance changes. Indications are given by deflections, directly on a scale. Platinum or base metal couples, or both, may be used with the same instrument. It is guaranteed accurate within 1/5 of one per cent. of full scale. The Pyrovolter is entirely self-contained and exceedingly rugged. It is adapted for all temperature measurement work with thermocouples, especially where known precision is essential; it is equally valuable for portable testing work, laboratory standardization, and general low voltage measurements. Furnished in from one to four ranges, marked either directly in degrees or in millivolts, or both. Built in portable and wall-type instruments. Catalog CE-17.

THERMOCOUPLES

We supply platinum and base metal thermocouples in all types of protection tubes. Couples of 12, 18 and 30 inches length are regularly carried in stock. Unusually sturdy construction is used throughout, assuring long life. Catalog CE-17



THERMOCOUPLE CALIBRATION OUTFIT
For accurately checking couples against both the melting points of metals and standard couples. Various outfits are offered, both with and without furnaces

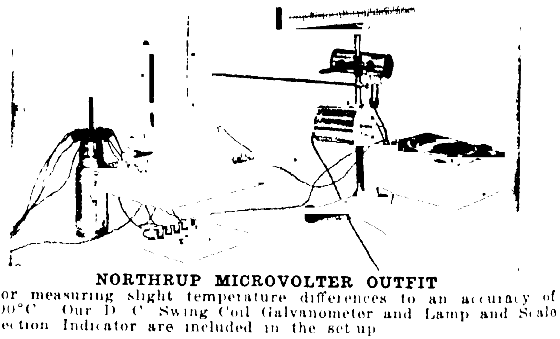
HYDROGEN-ION APPARATUS

H-ION PYROVOLTER
For use with low resistance electrodes

The Acree Apparatus for Hydrogen-Ion Determination offers both simplification and highest precision. In electrometric determinations, a double hydrogen electrode—the ultimate standard—is used. The difference of potential between the unknown solution against one hydrogen electrode and a standard buffer solution against another hydrogen electrode is measured. Calculation is of the easiest. Electrometric titrations may also be carried out. Two precise deflection potentiometers (Pyrovolter type) are supplied, one for use with electrodes of any resistance (including the Acree) and another for use with low resistance electrodes (Elliott, Clark, etc.). For colorimetric determinations, standard buffer tablets and standard indicator tablets are put up. A complete line of accessory indicators and chemicals is carried in stock. Catalog CE-18.

ELECTROMETERS

We have a complete line of instruments for electrostatic measurements, including the Compton Quadrant Electrometer and two types of string Electrometers. The Compton Quadrant Electrometer has a total range of 0-50,000 mm. per volt, and a capacity of only about 12 cm. Catalogs CE-16 and BE-19.



NORTHRUP MICROVOLTER OUTFIT
For measuring slight temperature differences to an accuracy of 1/200°C. Our D. C. Swing Coil Galvanometer and Lamp and Scale Reflection Indicator are included in the set up

LABORATORY MEASURING INSTRUMENTS

For general laboratory measuring work we offer both D. C. and A. C. Swing Coil Galvanometers with an improved lamp and scale for attachment direct to city lighting circuit, a complete line of precision dial decade resistance boxes and resistance standards, single value "Handy" Resistance Units of resistances from .1 ohm to 10,000 ohms, Wheatstone Bridges, and a variety of similar instruments of the highest quality.

PUBLICATIONS

We are always glad to forward a complete set of our literature on request, and also to place your name on our mailing list for the Pyrolectric Bi-Monthly Bulletin, a unique instrument publication. Bulletin BE-19 is a Condensed Catalog, briefly describing and listing each of our products.

QUIGLEY FURNACE SPECIALTIES COMPANY, Inc.

GENERAL OFFICES
26 Cortlandt Street
NEW YORK, N. Y.

Cable Address "QUIGLECO"

Code Used: WESTERN UNION, 5 LETTER

FACTORIES: JAMAICA, N. Y., FREDERICKSBURG, VA.

SALES OFFICES
BALTIMORE BUFFALO CHICAGO DENVER PHILADELPHIA PITTSBURGH PROVIDENCE
Representatives in 35 cities in the United States and Canada

PRODUCTS AND SERVICES

Hytempite - A Refractory Cement for bonding silica fire clay brick, and for kindred uses

Carbosand - A highly Refractory Granular Material for making rammed-in linings, special tile, patches, and [illegible] in furnace structures

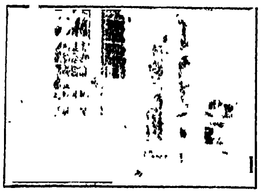
Insulbrix A specially prepared Cellular Insulating Refractory Brick which keeps heat in or out

Powdered Coal Equipment - Quigley System for preparing distributing and burning powdered coal and other fuels

HYTEMPITE

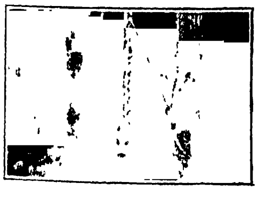
A high temperature furnace cement which forms a lasting union between materials to be joined It sets at normal temperatures and retains its strength up to temperatures at which the best quality of brick loses its strength and becomes soft

HYTEMPITE FOR CUPOLAS AND LADLES

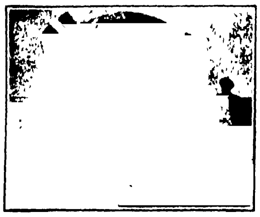


HYTEMPITE FOR BOILER SETTINGS

Hytempite, when used in place of fire clay for laying up brickwork, greatly adds to the life of the structure It is successfully used for furnace and boiler settings and repairs; for setting tile, retorts, oil stills; lining metal melting furnaces, pit furnaces, open flame melting furnaces, foundry cupolas and ladles, and as a core wash.

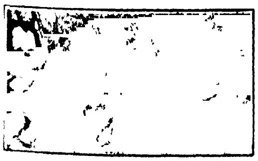


SEALING JAMB JOINTS OF COKE OVENS

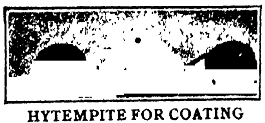


HYTEMPITE FOR LAYING UP LININGS OF LARGE LADLES

Tests have proven that Hytempite used as a binder, when air-set, forms a joint as strong as the refractory material united, and that the strength is not impaired but increased by the action of heat. This property makes a wall or structure impossible to obtain with fire clay, or other materials which depend on heat to effect a bond or vitrification



HYTEMPITE FOR PIT FURNACES



HYTEMPITE FOR COATING CORES

MIXING REFRACTORY MATERIALS WITH HYTEMPITE FOR RAMMED IN LININGS

Hytempite withstands the cutting action of flames and is especially recommended for oil furnaces where the gases are usually of high velocity

Hytempite can be used as a coating or wash, or to smoothen and harden the surface of a furnace lining to protect it from abrasion, etc

Hytempite can be used wherever fire brick or tile are used

CARBOSAND

A highly refractory fire sand made in the electric furnace by fusing at high temperature a mixture of natural silica in its purest form and petroleum coke Owing to its highly refractory nature it is an ideal material for use where the scouring action of flame or hot gases attack a lining

It is used for making rammed in linings, special shapes, tile and repairs, and for surfacing walls of furnaces or other structures subject to severe flame action

SPECIAL SHAPES AND TILE

INSULBRIX

A specially prepared cellular insulating refractory brick for furnaces or other structures These brick are made in standard fire brick size and special shapes Their weight is about one-half that of ordinary fire brick They have low thermal conductivity 1 in of Insulbrix being equal to six to ten times the same thickness of fire, or red brick, depending upon conditions such as furnace temperature, conductivity of other brick, etc They have high heat resisting quality, their fusing point being over 2900° Fahr without showing shrinkage at 1800° Fahr They have a crushing strength of 425 lbs to the sq in They are used as an insulating course in boiler settings, furnaces, kilns, ovens, or other structures where the conservation of heat is an important item

QUIGLEY POWDERED COAL SYSTEM

For preparing, transporting and burning powdered coal Pulverized coal is transported in bulk through small diameter standard wrought pipe to bins at furnaces.

Entire equipment is dust tight from crusher to furnaces.

With this improved method of burning powdered coal, the fuel is automatically weighed as sent to the furnace bins By turning a hand or chain wheel absolute control of fuel fed to the burners is obtained

Send for bulletins describing complete system, with illustrations of plants now in successful operation.

RAYMOND BROS. IMPACT PULVERIZER CO.

OFFICE AND WORKS
1309 N. BRANCH STREET, CHICAGO, U. S. A.

PRODUCTS

Roller Mills, Automatic Pulverizers, and Vacuum Air-separators for the fine grinding of all dry materials to a powder.

NO. 0000 PULVERIZER

This little mill comes most nearly filling all the grinding requirements of Chemical, Color, Dyestuffs and Paint Manufacturers and that is why we place it first in these pages.

We have been specializing in the grinding of all materials to a powder for the past 40 years and it has only been recently that there has been a large demand for a small, complete, dustless pulverizing unit which would do all things that our larger mills are doing successfully in hundreds of plants.

It was on this account that we designed the No. 0000 Pulverizer and it has amply proved its adaptability to small grinding requirements by the fact that in five years' time we have put more than four hundred of them in successful operation.

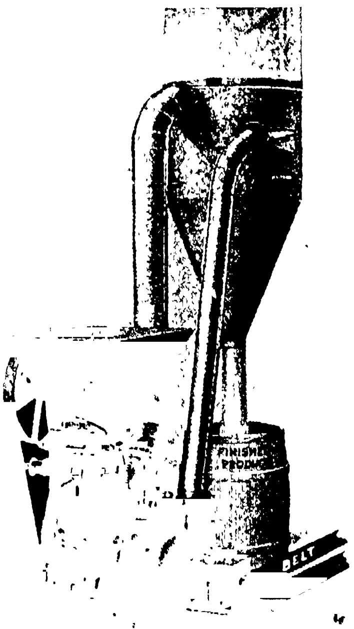
A good many firms use as many as five of them to handle their different materials and to produce an extremely fine uniform grind when they are unable to buy satisfactory ground products.

The No. 0000 Pulverizer has so many points of interest that they cannot all be mentioned in this small space, but a few of them are of special interest:

It is especially useful in handling small quantities of such materials as dry colors, clays, various paint materials, chemical compounds, dyestuffs, and similar products.

It is very compact, occupies 4 by 4½ ft. of floor space, requires 5 H. P. and gives 200 to 1000 lbs. per hour capacity, depending upon material. It gives any fineness from 50 mesh to 200 mesh and finer.

A special circular giving full description will be sent on request.



NO. 0000 RAYMOND PULVERIZER

ROLLER MILLS

These are built for capacities of from 1 to 10 tons, per hour and for fine or coarse grinding.

They are of the suspended roller type, crushing and pulverizing the material by centrifugal force. The fine material is carried away from the grinding chamber by our air separation principle as fast as it is made, eliminating the clogging effect produced by screen separation. In this way the rolls are always working on coarse material.

Raymond roller mills have been adopted as standard equipment by many large industrial corporations for grinding materials such as coal, coke, gypsum, limestone, phosphate rock, etc., to 100-mesh; and talc, graphite, barytes, caustic lime, lithopone, etc., to 200-mesh and finer.

RAYMOND ROLLER MILL

AUTOMATIC PULVERIZERS

These, like the roller mills, are equipped with air separation for the production of uniform fine products, but they are of the high speed type and therefore used for softer materials like clay, dry colors, hydrated lime, litharge, etc.

They are built in several sizes and will grind to any fineness by a simple adjustment in the air separator.

They can also be equipped with our special automatic throw-out attachment for separating impurities from such materials as hydrated lime, litharge, etc.

Because of this special attachment they have been adopted by the United States Government for separating the values from radium ore.

RAYMOND AUTOMATIC PULVERIZER

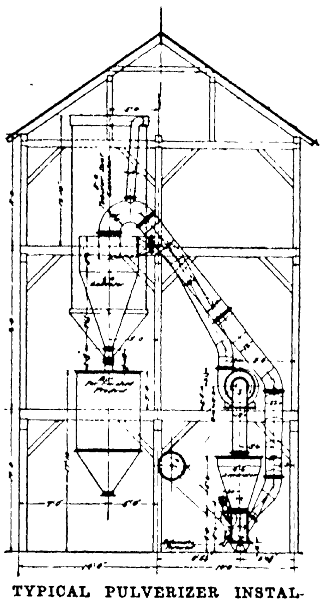
Continued on Next Page

SPECIAL FEATURES AND ADVANTAGES

The installation shown is typical of the Raymond system as in all cases the piping can be arranged to allow placing the collector at almost any point where the material is to be discharged.

This discharge can be made into any convenient storage bin or conveyor and requires no extra power for operation.

In some of these installations the collector is set as high as 100 ft., and at a distance from the mill, eliminating at least one elevator and sometimes a conveyor.



TYPICAL PULVERIZER INSTALLATION

No Screens or Bolters—The mills shown on these pages require no screens or bolters to produce the required fineness, as this is obtained automatically by the use of our air separators. These separators after once being adjusted require no attention and produce absolutely uniform fine products containing no lumps or over sizes. They will give any fineness desired by a simple adjustment.

Dustless Operation—The Raymond system is entirely enclosed and dustless in operation, as it is one complete unit which receives material from storage, pulverizes it, and delivers a uniform fine product to the required point.

MATERIALS USED FOR WEARING PARTS

All parts of the roller mills and pulverizers are built of the best and most economical materials for their particular purposes.

In the roller mills, the die ring against which the rolls crush the material is made of a special steel. The rolls are made of chilled iron which is 1½ ins. thick. The other wearing parts in the mill, such as plows and plow tips (which throw the material up between the roll and ring), liners for the ports in the base of the mill, etc., are made of manganese steel.

In the pulverizers, the beaters for breaking up the material are made of manganese steel, and the beater chamber is lined with cast iron liners which can be readily replaced, eliminating any chance for the pulverizer itself to wear out.

The fans for both the roller mills and the pulverizers are of our own special make, using heavy cast iron shells over one inch thick. These shells can also be lined with replaceable iron liners to withstand abrasive materials in case the customer requires it. The fan wheel is composed of a cast steel spider, to which are attached either removable manganese, blue annealed, or tank steel blades. Which kind of blades is used depends upon the material ground.

We have found by experience that all of these materials used for wearing parts are the most economical for that particular purpose. There are harder forms of steel which would last longer for some of these purposes, but the costs are so great that it is economy to use the materials we have mentioned and change oftener.

The air separator, cyclone collector and piping are made of extra heavy gauges of galvanized steel.

All parts are machined, fitted and assembled in our own plant, and repairs are always kept on hand for immediate shipment in case of a breakdown.

HOW TO SPECIFY

To enable us to quote prices and guarantees on the right machinery, it is necessary to have all the information that can be supplied in regard to the proposition.

Always include the material to be ground and the capacity and fineness required. In this connection we would like to have some small mail samples, showing the crude material intended for the mill and the finished product to be duplicated.

If there is no sample of the finished product, kindly advise, in the terms of the Tyler standard screen scale, the fineness required.

COOPERATIVE·SERVICE

The Engineering Department, backed by 40 years' experience in the pulverizing field, is available for advice in regard to the solution of grinding problems.

In many cases, by using special equipment in connection with the standard mills, it has been able to solve a customer's grinding problem and greatly decrease cost of production.

The department will also design an installation best suited to the requirements if sketches of the present or proposed plant are enclosed, showing approximately where the pulverizing machinery is to be placed.

GUARANTEE

Every Raymond mill is guaranteed, not only as to workmanship, but also as to performance. After receipt of full information in regard to pulverizing problem, we will send contract covering this guarantee.

PARTIAL LIST OF MATERIALS HANDLED BY THE RAYMOND SYSTEM

Aluminum silicate
Arsenate of lead
Asbestos and asbestos rock
Asphalt and asphalt rock
Barytes
Bauxite
Blacking materials
Blood (dried)
Blue stone
Bone black
Borax ore and borax
Calcite
Calcium phosphate
Carbon
Carbonates
Carnotite ore
Casein (dried milk)
Cast iron borings
Chalk
Charcoal
China clay
Chrome colors
Chromite
Clay
Coal
Cobalt
Cobalt oxide
Coke
Copper oxide
Diatomaceous earth
Elevator screenings
Enamel (white)
Felspar
Fertilizers
Filter press products
Foundry facing
Fuller's earth
Glass
Graphite
Gypsum rock and plaster
Infusorial earth
Insecticide powder
Iron ores
Iron oxides
Iron, Sulphate of
Kaolin
Kelp
Kieselguhr
Lampblack
Lead ores
Lime, Borate of
Lime, Caustic
Lime, Hydrated
Limestone
Lithopone
Magnesite
Magnetite
Manganese ore
Manganese oxide
Marble and marble dust
Marl
Medicinal powders
Mica
Milk sugar
Ocher
Paints (dry colors)
Oxalic acid
Paints (iron ores)
Paints (litharge)
Paints (ocher)
Paints (slate)
Paints (umber)
Paris green
Peanut vine
Phosphate rock
Pitch
Plaster of Paris
Pumice stone
Red lead
Retarder
Rosin
Rottenstone
Rubber, hard
Salt
Shale
Shellac
Shells (all kinds)
Silica
Slags (all kinds)
Slate
Soap
Soapstone
Soda, Bicarbonate of
Sodium nitrate
Starch
Sugar
Sulphur
Talc
Tin oxide
Tobacco
Trap rock for asphalt paving
Tripoli
Waterproofing
White lead
Zinc skimmings

And a number of composite materials impossible to classify.

RAYMOND ENGINEERING CORPORATION

General Offices, Puck Building
309 LAFAYETTE STREET, NEW YORK, N. Y.

WORKS
Farmingdale, L. I

PRODUCTS

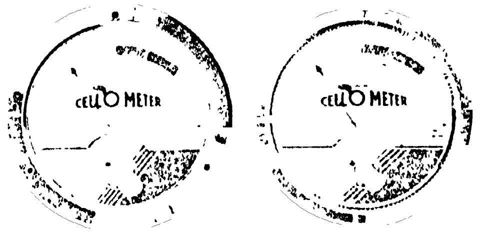
- Ammeters
- Cell-O-Meters
- Circuit Breakers
- Contact Making Devices
- Electrical Heating Devices
- Gas Engines
- Lamp Fixtures
- Lighting Devices
- Pumps
- Regulators
- Rheostats
- Solenoids
- Spring Motors
- Thermostatic Controls
- Special Machinery

SERVICE

Our engineering department is at the service of the chemical industry in solving such problems as we are particularly acquainted with.

We are well adapted to develop small mechanical devices needed to meet special requirements.

CELLOMETERS



CELLOMETERS

The Cellometer is the only battery-indicating instrument invented which combines the feature of an ammeter and an electrical battery tester. By simply pressing the button, the ammeter is eliminated from the circuit.

The Cellometer checks the electrical condition of the battery by superimposing about a quarter load through an especially designed resistance unit, and a reading is then obtained, which is indicated by having three distinct spaces on the dial. The green indicates a full battery; the yellow a half discharged battery; and the red a fully discharged battery, but is so "calibrated" that when reading "red" it is not yet too late to have the battery overhauled.

The old method of using a hydrometer is unnecessary when the Cellometer is employed, as a false reading can easily be obtained on a hydrometer by simply placing electrolyte of different specific gravity in the battery.

The Cellometer can be used for both a battery-testing instrument, and as an ammeter. It is designed for use on all types of storage batteries, whether used in automobiles, farm-lighting plants, fire-alarm systems; or in fact anywhere that the storage battery is employed, the Cellometer is invaluable.

The Cellometers are manufactured in different styles and finishes. The model shown herewith is a type for automobiles which replaces the present ammeter now in use, by simply using the same wires that run to the ammeter.

ROTARY PUMPS

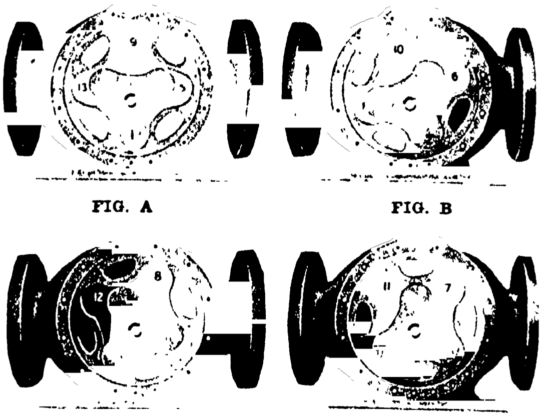


FIG. A FIG. B

FIG. D FIG. C

EXETER ROTARY PUMP

The types of rotary pumps thus far evolved may be divided broadly under these classifications: first, those using the rotary gear movement; second, the rotary plunger types, and third, the rotary bucket or packing-strip types. Practically all of these designs require continuous replacement due to the great friction taking place between either the moving parts themselves or between the moving parts and the casing.

The **Feuerheerd** Rotary Pump is based upon an entirely new idea of rotary pump construction, combining in one compact unit the principal advantages to be found in the centrifugal and reciprocating types of pumps without the shortcomings of either. The pump is self-priming; its action is positive and the flow of the water is continuous. There are no valves and no reciprocating parts to get out of order and, compared with its output, the size of the pump is remarkably small.

Because of its rolling rather than rubbing surfaces, all wear has been reduced to a minimum. Dirt and grit do not seem to affect the pump, inasmuch as there is practically no wearing or sliding contact.

The **Feuerheerd** Rotary Pump can be arranged direct-connected, geared, or belt-driven to operate with any form of drive, i. e., electric motor, turbine, and steam, gas, or oil engine. These pumps are especially suitable for general water and fire service, for boiler feed, circulating and lubricating work, for creating vacuums for evaporation in pans, condensers, refrigerators, etc., and for handling oils, syrups, milk, molasses, mine water, tar, asphalt, acids, chemicals, paints, turpentine, gasoline, soaps, etc.

The action of the pump can readily be understood by examination of the four illustrations at the top of the page.

We manufacture the smaller sized Pumps under this patent for the Exeter Machine Works, Inc., whose general offices are located in New York, N. Y. The exclusive sales and manufacturing rights for the automotive industry in this country, however, are held under a sub-license from the Exeter Machine Works, Inc., by the Raymond Engineering Corporation.

READ MACHINERY CO.

Manufacturers of

Mixing Machinery

YORK, PA.

PRODUCTS

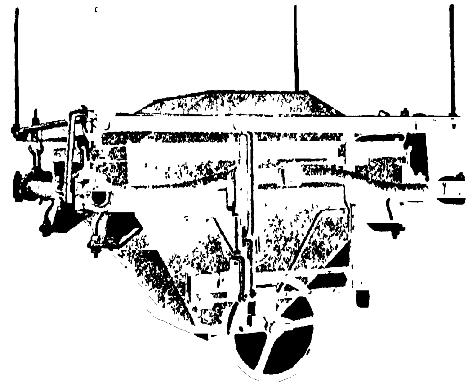
Mixing Machinery, Sifting and Blending Machinery, Automatic Weighing Hoppers.

FACILITIES

The Read Machinery Company has for years been building a complete line of modern mixing machinery until recently chiefly used in the baking industry. Many mixing, grading, blending and sifting problems encountered in the making of products from flour are similar to those met with in the manufacturing fields producing pharmaceuticals, cosmetics, food products, dry colors, dyes, etc. Those in the above manufacturing lines should investigate our equipment before adding to their production facilities.

READ AUTOMATIC WEIGHING HOPPER, FOUR POINT SUSPENSION TYPE

Accuracy, in combination with rapid handling, is assured in using this Hopper. Weighing is automatically controlled, and material delivered direct to mixer. Labor is greatly reduced and production increased.



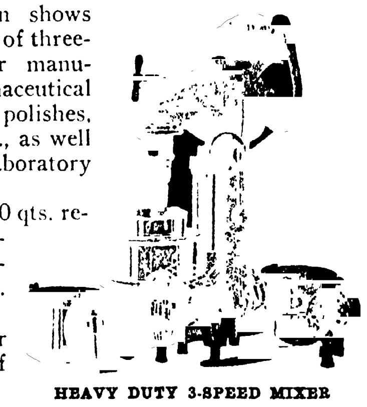
AUTOMATIC WEIGHING HOPPER

READ THREE-SPEED MIXER

This illustration shows Type D of our line of three-speed mixers for manufacturing pharmaceutical products, pastes, polishes, food products, etc., as well as for many laboratory purposes.

Capacity up to 80 qts. requires 1 H.P. motor giving a maximum of 400 R.P.M. for the beater.

Write for our complete catalog of these machines.

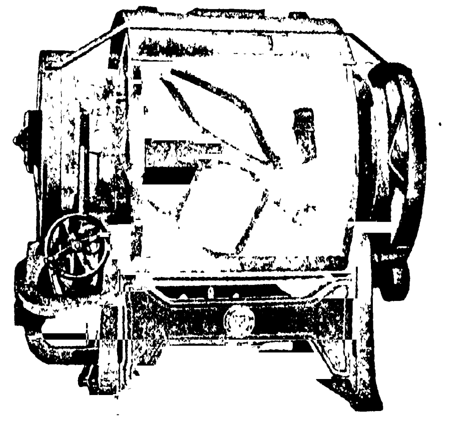


HEAVY DUTY 3-SPEED MIXER

READ REVERSIBLE DOUBLE ARM MIXER

This mixer has a capacity up to 1800 lbs. (water), is motor or belt driven, and is geared between 20 and 40 R.P.M. with our standard mixing arms. Higher speed arms can be supplied. 20-30 H.P. is required.

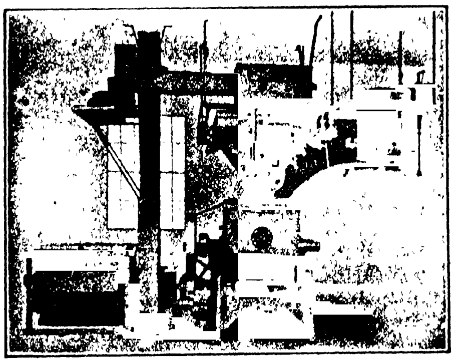
This machine is one of a number of types and sizes of our mixers. There is one of these machines for every mixing problem.



READ REVERSIBLE DOUBLE ARM MIXER

COMPLETE SIFTING, WEIGHING AND MIXING UNIT

The accompanying illustration shows a complete unit manufactured by us that will meet such demands as sifting talc, weighing it, and treating it with essential oils and mixing the materials in the making of talc powders. Many other products can be made requiring similar methods of treatment with economy in operating, labor and production costs.



COMPLETE SIFTING, WEIGHING AND MIXING UNIT

READING IRON COMPANY

Guaranteed Genuine Wrought Iron Pipe, Etc.

READING, PA.

Cable Address
"READIRON"

Codes Used·
Lieber, A, B, C, 5th and 6th
Western Union, and Private

New York
Boston

Philadelphia
Pittsburgh

Chicago
Cincinnati

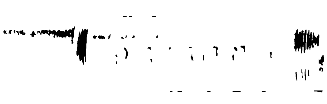
Fort Worth
Los Angeles

PRODUCTS

Guaranteed Genuine Wrought Iron Pipe, Casing, Line, and Drive Pipe for the Oil and Gas Industry and for Brine Wells, etc. Wrought Iron Pipe Bends and Coils. Charcoal Iron Boiler Tubes. Sugar Mills, Cotton Compresses, and other Special Heavy Machinery. Special Heavy Castings of all kinds. General Forgings up to 50 Tons.

THE READING IRON COMPANY

Reading Iron Company, the world's **oldest** and **largest** producer of Genuine Wrought Iron Pipe, manufactures 552 different sizes and kinds of tubular products, ranging from 1/8 to 20 inches in diameter, suitable for every industrial piping requirement.



SECTION OF PIPE SHOWING MARKING

Every length of Reading Wrought Iron Pipe has the word READING rolled in the iron, as shown in the above illustration, except Redrawn Pipe, which has the letters depressed.

WROUGHT IRON PIPE IN THE CHEMICAL INDUSTRIES

For reasons to be explained later in these pages, Genuine Wrought Iron Pipe is vastly superior to steel pipe for industrial chemical requirements.

Its far greater ability to withstand corrosion recommends its use wherever the nature of the material being handled does not preclude the use of iron in any form.

In addition to its use for water, steam, air, and vacuum lines, it is extensively used for the following purposes, among others:

- Crude oil and petroleum derivatives and gases
- Illuminating and fuel gas and various by-products of gas manufacture
- Solvents such as acetone, methyl alcohol (wood alcohol), industrial alcohol, ether, etc
- Ammonia, caustic soda liquor, potash liquor, brine, salt solutions, calcium chloride solutions, and other alkalis
- Certain concentrations of sulphuric and nitric acids, mixed or separate
- Animal and vegetable oils, soap, glycerine, glycerine water, and various soap factory wastes
- Paper stock, pulp, waste liquors, etc, in pulp and paper mills.

WHAT WROUGHT IRON PIPE IS

Considerable confusion still exists between the terms "wrought pipe" and Wrought **Iron** Pipe. Wrought **Iron** Pipe is a definite term designating the product of the puddle furnace, and is a high grade quality product. "Wrought Pipe" is an indefinite term used as a nom de plume for ordinary steel pipe—produced by the Bessemer or Open Hearth processes.

Contrary to the definite and logical terminology as adopted by the National Society for Testing Materials, the National Pipe and Supplies Association, and such publications as the IRON AGE and the IRON TRADE REVIEW, certain manufacturers still insist on selling their ordinary steel pipe under the misleading term, "wrought pipe." Engineers who specify wrought **iron** pipe for its far more satisfactory service and greater ultimate economy, should carefully examine the pipe supplied. Two simple but accurate tests are given elsewhere in these pages.

WHY WROUGHT IRON IS BETTER THAN STEEL FOR MAKING WELDED PIPE

The primary requisites for good pipe are corrosion-resistance, uniformity, sound welds, and good threading qualities. Reading Wrought Iron Pipe possesses all four of these characteristics to a maximum degree. During refinement by the puddling process, wrought iron receives as an inseparable component, a corrosion-resisting basic silicate of protoxide of iron, known as slag. Subsequent rolling and rerolling of the metal elongates and thoroughly distributes this slag content into minute threads or filaments which group the grains into clusters and give to Reading Wrought Iron its characteristic fibrous structure. In the Bessemer or Open Hearth processes, by which steel is made, the production of a siliceous slag is impossible, and steel is therefore totally lacking in this protecting content which is largely responsible for the superiority of Reading Wrought Iron Pipe.

Wrought Iron gives two to three times the length of service of steel pipe; its incorrodible siliceous slag fibers resist corrosion and greatly retard its progress through the metal. Steel, having no protecting slag content, offers to corrosion an unobstructed path from surface to surface.

Wrought Iron gives sound welds; its slag content is a natural flux, totally lacking in steel.

Wrought Iron is uniform in structure. The continual agitation and rolling during its refining and cooling stages renders impossible the segregation of impurities that characterizes steel, and is responsible for the known irregularity of steel pipe in actual service.

Wrought Iron cuts and threads more easily and cleanly. Because of its uniform, fibrous structure, wrought iron does not require special dies, nor do standard dies gouge or burr the threads.

Wrought Iron is vastly more economical. Its somewhat higher initial cost buys two or three times the life of steel—a genuine ultimate economy, since failure of the pipe means replacement of the entire system, including labor costs, haulage, valves, fittings, etc.

Continued on Next Page

TWO TESTS FOR WROUGHT IRON PIPE

The Acid Test—After removing all marks of the cutting off tool, and making sure that the end of the pipe is smooth, suspend it so that the end will dip into a solution of 10 parts water and 4 parts sulfuric acid (1.84 specific gravity), taking the usual precaution of pouring the acid very slowly into the water. A mixture of, say, ½ ounce acid to 1¼ ounces water is about right. Keep the pipe immersed for about one hour. Wash off the acid after removing the pieces to be tested and dry quickly with a soft rag.

If the pipe is steel the end will have been eaten by the acid uniformly and smoothly. If wrought iron, the end will show ridges or layers, indicating the great resistance of the siliceous slag content.

The Manganese Test—Place in a small clean test tube a small chip about the size of a large pinhead, or filings equal in bulk to this. Add a few drops of chemically pure nitric acid (specific gravity 1.2), heat with a match until the metal is completely dissolved. Let the solution cool till the tube can be held in the hand without discomfort and add as much sodium bismuthate as will lie on the point of a small penknife blade, or as much more as may be required to leave a small amount of brown residue. Bubbles of oxygen gas are given off by the solution when the bismuthate is added, after which a pink or red color may appear in the solution, indicating the presence of manganese, which shows that the material is steel. If no such tint appears, or only a very slight pinkish discoloration is visible, the material is iron.

SPECIFICATIONS FOR READING GUARANTEED GENUINE WROUGHT IRON STANDARD WELDED PIPE

1 **Material**—Lapweld and Buttweld pipe is to be made of guaranteed quality Genuine Wrought Iron made from No 1 Gray Forge Pig Iron, by the process of puddling, and no scrap or cuttings except crop ends from the sheet or crop ends of the pipe itself shall be used in the manufacture. The use of steel scrap will not be permitted to enter into any part of the process of manufacture of the iron.

2 **Process of Manufacture**—All pipe must be made either by the Lapweld or Buttweld process. Sizes 1½ inch and smaller, standard and special sizes, are Buttweld. All 2 inch and larger standard and special sizes are made Lapweld. 1¼ inch and 1½ inch are made Lapweld when specified. All in accordance with the best methods and practise.

3 **Surface Inspection**—All pipe must be reasonably straight and free from blisters, cracks, or other injurious defects. Liquor marks incidental to manufacture of the pipe will not be considered as surface defects. The pipe shall not vary more than 1% either way from being perfectly round or true to size, outside diameter, except on the small sizes where a variation of 1/64 inch will be accepted. **The pipe must not vary more than 2½% below or 5% above standard weight.**

4 **Threading and Reaming**—All pipe must have a good Briggs' Standard thread, which will make a tight joint when tested by hydrostatic pressure at mill (See Tests). The thread must not vary more than one and one-half turns either way when tested with a Pratt & Whitney standard gauge.

5 **Internal Pressure Test**—The following hydrostatic test pressures must be applied to the respective sizes of standard Buttweld and Lapweld pipe as indicated in table

Nominal Size	Method of Manufacture	Test Pressure Pounds
⅛ inch to 1½ inch (inclusive)	Buttweld	750
1½ inch and 8 inch	Lapweld	1000
9 inch and 10 inch	Lapweld	900
11 inch and 12 inch	Lapweld	800
13 inch and 14 inch	Lapweld	700
15 inch O D	Lapweld	600
17 inch O D 18 inch O D and 20 inch O D	Lapweld	550

All specials, or weights other than standards to be tested specially

6 **Testing of Materials**—The iron from which the pipe is made must show the following physical properties

Tensile strength .	45,000 pounds to 55,000 pounds
Elastic limit .	25,000 pounds to 35,000 pounds
Elongation 8 inches	12% to 25%
Reduction of area.	17% to 25%

7 **Couplings**—The material is to be made from No 1 Gray Forge Pig Iron by the process of puddling, and no scrap or cuttings, except crop ends from the sheet or crop ends from the pipe itself, shall be used in the manufacture. The material must be sound and free from injurious defects for Standard Pipe Couplings. Threads must be clean cut, tapped straight through and of such pitch diameter as will make tight joint, the ends must be countersunk. Couplings for Oil Country Goods must be made from Double Refined Wrought Iron. All Standard Pipe Couplings larger than 1½ inches and all Oil Country Couplings must be full taper tapped on each end, faced and recessed.

8 **Thread Protection**—Full length tapped rings or split couplings must be provided as thread protectors on all sizes, 4 inch diameter or larger. Protectors must be provided for small sizes when specifically called for on order. On all Oil Country Goods the threads must be protected with heavy rings or split couplings.

9. **All tests shall be made at the mill.**

READING STANDARD GENUINE WROUGHT IRON PIPE, BLACK AND GALVANIZED

	Size	Diameters External	Diameters Internal	Thickness	Weight per Foot Plain Ends	Weight per Foot Threads & Couplings	Threads per Inch	Length of Thread	Taper per Foot	Hydrostatic Test
Buttweld	⅛	.405	.266	.070	.244	.245	27	¼	¾	750
	¼	.540	.360	.090	.424	.425	18	½	¾	750
	⅜	.675	.489	.093	.567	.568	18	⅝	¾	750
	½	.840	.617	.111	.850	.852	14	⅝	¾	750
	¾	1.050	.819	.115	1.130	1.134	14	¾	¾	750
	1	1.315	1.043	.136	1.678	1.684	11½	1	¾	750
	1¼	1.660	1.374	.143	2.272	2.281	11½	1	¾	750
	1½	1.900	1.604	.148	2.717	2.731	11½	1	¾	750
Lapweld	1½	1.900	1.604	.148	2.717	2.731	11½	1	¾	1000
	2	2.375	2.060	.158	3.652	3.678	11½	1	¾	1000
	2½	2.875	2.460	.208	5.793	5.819	8	1½	¾	1000
	3	3.500	3.059	.221	7.575	7.616	8	1⅝	¾	1000
	3½	4.000	3.538	.231	9.109	9.202	8	1¾	¾	1000
	4	4.500	4.016	.242	10.790	10.889	8	1¾	¾	1000
	4½	5.000	4.496	.252	12.538	12.642	8	1¾	¾	1000
	5	5.563	5.036	.263	14.617	14.810	8	1¾	¾	1000
	6	6.625	6.053	.286	18.974	19.185	8	1¾	¾	1000
	7	7.625	7.010	.307	23.544	23.769	8	1¾	¾	1000
	8	8.625	8.059	.283	24.696	25.000	8	1¾	¾	800
	8	8.625	7.967	.329	28.554	28.809	8	1¾	¾	1000
	9	9.625	8.927	.349	33.907	34.188	8	2¼	¾	900
	10	10.750	10.181	.284	31.201	32.000	8	2¼	¾	600
	10	10.750	10.124	.313	34.240	35.000	8	2¼	¾	800
	10	10.750	10.005	.372	40.483	41.132	8	2¼	¾	900
	11	11.750	10.985	.382	45.557	46.247	8	2¼	¾	800
	12	12.750	12.077	.336	43.773	45.000	8	2½	¾	600
	12	12.750	11.985	.382	49.562	50.706	8	2½	¾	800
	13	14.000	13.250	.375	53.510	55.824	8	3	¾	700
	14	15.000	14.250	.375	57.437	60.375	8	3	¾	700
	15	16.000	15.250	.375	61.361	64.500	8	3	¾	600

Furnished with threads and couplings and in random lengths unless otherwise ordered.

All weights given in pounds. All dimensions given in inches. All weights and dimensions are nominal.

The weight per foot of pipe with threads and couplings is based on a length of 20 feet, including the coupling, but shipping lengths of small sizes will usually average less than 20 feet.

Permissible variation in weight is 2½% below and 5% above weights given in tables.

All weights figured on the basis of 1 cu in Wrought Iron weighing .278 lbs.

All pipe threaded to Briggs' Standard Gauges as made by Pratt & Whitney Co., Hartford, Conn.

For cut lengths an extra charge will be made above random lengths.

For pipe smoothed on the inside known as plugged and reamed, an extra charge will be made above Standard Pipe.

For Galvanized or Coated Pipe an extra charge will be made above Black.

When ordering sizes 8 inch to 12 inch please state weight of pipe wanted.

READING X HEAVY AND XX HEAVY GENUINE WROUGHT IRON PIPE, BLACK AND GALVANIZED

Extra Strong

	Size	Diameters External	Diameters Internal	Thickness	Weight per Foot Plain Ends	Hydrostatic Test
Buttweld	⅛	.405	.210	.098	.314	750
	¼	.540	.295	.122	.535	750
	⅜	.675	.417	.129	.738	750
	½	.840	.539	.151	1.087	750
	¾	1.050	.735	.157	1.473	750
	1	1.315	.949	.183	2.171	750
	1¼	1.660	1.269	.195	2.996	1500
	1½	1.900	1.491	.204	3.631	1500
Lapweld	1½	1.900	1.491	.204	3.631	2500
	2	2.375	1.929	.223	5.022	2500
	2½	2.875	2.311	[illegible]	7.661	2000
	3	3.500	2.887	.306	10.252	2000
	3½	4.000	3.350	.325	12.505	2000
	4	4.500	3.811	.344	14.983	2000
	4½	5.000	4.275	.363	17.611	1800
	5	5.563	4.797	.383	20.778	1800
	6	6.625	5.743	.441	28.573	1800
	7	7.625	6.603	.511	38.048	1500
	8	8.625	7.604	.510	43.388	1500
	9	9.625	8.604	.510	48.728	1500
	10	10.750	9.729	.510	54.735	1200
	11	11.750	10.729	.510	60.075	1100
	12	12.750	11.729	.510	65.415	1100

Double Extra Strong

Size	Diameters External	Diameters Internal	Thickness	Weight per Foot Plain Ends	Hydrostatic Test
½	.840	.226	.307	1.714	750
¾	1.050	.413	.318	2.440	750
1	1.315	.576	.369	3.659	750
1¼	1.660	.874	.393	5.214	2200
1½	1.900	1.078	.411	6.408	2200
2	2.375	1.480	.447	9.029	3000
2½	2.875	1.742	.567	13.695	3000
3	3.500	2.270	.615	18.583	3000
3½	4.000	2.697	.651	22.850	2500
4	4.500	3.119	.690	27.541	2500
4½	5.000	3.546	.727	32.530	2000
5	5.563	4.028	.768	38.552	2000
6	6.625	4.857	.884	53.160	2000
7	7.625	5.835	.895	63.079	2000
8	8.625	6.835	.895	72.424	2000

Extra Strong and Double Extra Strong pipe will be shipped in random lengths and with plain ends unless otherwise ordered.

All weights given in pounds. All dimensions given in inches. All weights and dimensions are nominal.

Random lengths X Strong and XX Strong considered to be 12 to 20 ft.

If fitted with threads and couplings an extra charge will be made above regular. When X Strong and XX Strong is ordered with threads and couplings, regular Line Pipe Couplings will be furnished, unless otherwise specified.

For cut lengths, an extra charge will be made above random lengths.

For Galvanized or Tar Coated Pipe, an extra charge will be made above Black.

All Double Extra Strong Pipe made from a solid sheet, not telescoped.

READING VALVE AND FITTINGS CO.

Pratt and Cady Division
HARTFORD, CONN.

PRODUCT

Bronze and Iron Valves for All Services.

BRONZE GLOBE AND ANGLE VALVES

Renewable Disc Type—Made in sizes ⅛" to 3" inclusive in two weights suitable for 150 and 250 pounds steam pressure respectively. Both weights are made with screwed hubs and the 150 pound line is also made with a union bonnet. The 150 pound lines have the well-known P&C renewable asbestos disc; the 250 pound line has a renewable solid bronze disc and renewable seat ring.

Regrinding Type—Made in sizes ⅛" to 3" inclusive in three weights suitable for 200, 250, and 300 pounds steam respectively.

These valves are of the regrinding type and carry certain special features which make them particularly suitable for severe service. The 300 pound line can be equipped with renewable seat rings when so ordered.

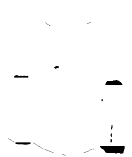


Fig. 9

IRON BODY GLOBE AND ANGLE VALVES

Made in two styles, one with renewable asbestos disc for 150 pounds steam and the other with 45° seat, in two weights, 150 and 250 pounds steam respectively.

The renewable asbestos disc type is made in sizes 2" to 14" inclusive.

The 45° seat valves are made in sizes 2" to 10" inclusive.

These valves are all built with renewable seat rings, can be packed under pressure and all parts renewed without taking the valve from the pipe line.

Fig. 65

BRONZE GATE VALVES

Made in all sizes and in five weights suitable for 125 pounds steam, 150 pounds steam, 175 pounds steam, 250 pounds steam and 800 pounds water respectively. The 150, 250 and 800 pound lines have renewable seat rings which can be changed without removing the valve from the line.

All P&C gate valves are equipped with double faced bronze wedges which permit the pressure to be applied upon either side and are reversible.

IRON BODY WATER GATE VALVES

Sizes 3" to 24" for 125 to 150 pounds working pressures, 14" to 24" for 75 to 100 pounds working pressure, and 10" to 24" for 35 to 75 pounds working pressures. We also make high pressure hydraulic valves for 800 and 1500 pounds working pressure respectively in sizes 1½" to 8". These valves are bronze trimmed. In opening, one turn of the spindle releases the wedge in the gate, allowing the valve to open freely, without friction. Furnished with inside screw or with outside screw and yoke.

Fig. 187

SWING CHECK VALVES

Bronze and Iron.

Bronze swing check valves made in sizes ⅛" to 3" inclusive for all pressures and purposes.

Iron body swing check valves made in sizes 2" to 24" inclusive for 150 pounds water; sizes 3" to 12" inclusive conform to Fire Underwriter's specifications. We also make a line suitable for 300 pounds water in sizes 2" to 12" inclusive. Working parts for any of these valves can be renewed or the disc reground without removing the valve from the line. The only tools necessary for regrinding are a wrench and brace and bit.

Made in screwed, flanged or bell ends.

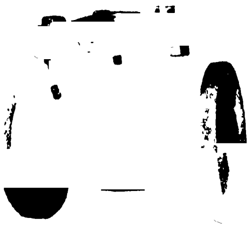


Fig. 220

IRON BODY GATE VALVES

Made in 2" to 16" sizes for 125 pounds, 150 pounds and 200 pounds steam working pressure and 2" to 24" sizes for 250 pounds steam working pressure. The 125 pound line will be furnished built to Underwriter specifications if desired. All the valves are bronze trimmed and have bronze faced solid wedges except the 125 pound valves, which can be furnished with a new design of split wedge, so made as to have the advantages, but not the disadvantages usual to a split wedge. These valves are made in the inside screw, outside screw and yoke and quick opening type and with screwed, flanged or bell ends.

Fig. 125

ASBESTOS PACKED COCKS

Bronze and Iron.

Bronze cocks in sizes ¼" to 4" for 150 and 250 pounds steam working pressures respectively.

Iron cocks in sizes ¼" to 4" for 100 to 125, 150 to 200, and 250 pounds steam working pressures respectively. Also made in sizes up to 10" for the various pressures, with worm gear operating attachment.

The dove-tailed "U" shaped grooves in the body are packed with prepared asbestos and afterwards subjected to a special vulcanizing process. An asbestos ring is used on the shoulder of the plug for top packing. The plug is carefully finished and barffed to make it rust proof. It has no metallic bearing, coming in contact only with the asbestos which compensates for the differential expansion of the plug and body.

These cocks give excellent results as boiler blow-off valves and on other severe services where other types of valves fail.

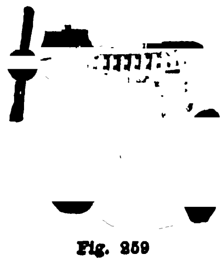


Fig. 259

READING VALVE AND FITTINGS CO.

Manufacturers of

Cast Steel Valves, Fittings and Flanges and Bronze and Iron Valves

READING, PA.

Boston Hartford New York Philadelphia Pittsburgh

Detroit St Paul San Francisco Cleveland Houston

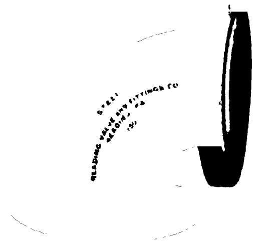
Reading Division

PRODUCTS

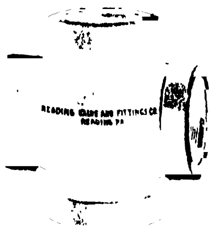
Acid Open Hearth Cast Steel Valves, Flanges and Fittings for All Temperatures and Pressures.

READING STEEL

The merits of the several methods and combinations of methods of steel making were carefully weighed by our engineers before it was decided to install acid open hearth furnaces to make the steel for Reading Cast Steel Valves, Fittings and Flanges. The open hearth process permits of taking frequent samples for analysis during the heat and of close control, resulting in uniformity of the steel, and the acid furnace yields a steel with a minimum of occluded gases, and therefore greatest freedom from gas bubbles and porosity.



FLANGED ELL



SCREWED CROSS

EXPERIENCE

The Reading Foundry has, throughout its existence, been exclusively a steel casting plant and for several years has specialized on pressure castings. It was early discovered that the molding practise is of primary importance in this class of work and intensive study has resulted in advanced methods, particularly to secure proper venting of the molds and to make proper provision for shrinkage. Experience has also led us to thoroughly anneal every flange and fitting.

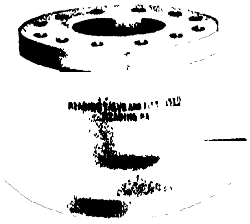
APPLICATION

Reading Cast Steel Valves, Fittings and Flanges are essential for services involving high pressures and temperatures or sudden reversals of temperature, not only because of its great strength, but more particularly because of the perfect elasticity and reliability of the steel. Up to 800° F. the elasticity and reliability are unimpaired and the loss in strength is so small as to leave large factors of safety at the maximum working pressures specified.

These flanges and fittings are recommended for all superheated steam piping, for oil, asphalt and other stills, for steam jacketed kettles, hot oil jacketed kettles, autoclaves, hydraulic presses, refrigerating equipments, condenser coils, etc.

Standard cast steel fittings are made on the same patterns as standard cast iron fittings, but are good for all the services of extra heavy cast iron.

SCREWED RETURN BEND



FLANGED NOZZLE

PROPERTIES OF READING CAST STEEL FLANGES AND FITTINGS

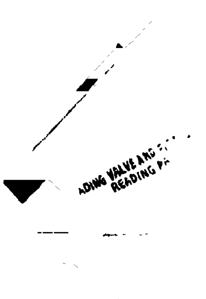
Class	Type	Steam Working Pressure	Cold Water or Oil Working Pressure No Shock	Cold Water or Oil Working Pressure With Shock	Test Pressure
Standard	Flanged Screwed	250	500	250	1000
Medium	Flanged	250	500	250	1000
Extra Heavy	Flanged Screwed	350 350	600 1200 to 1500	350 400	1200 1800 to 1250
800 lb Hydraulic	Flanged	.	800	500	1200
1200 lb Hydraulic	Flanged	. .	1200	800	1800
3000 lb Hydraulic	Flanged Screwed	. .	3000	2000	4500
6000 lb Hydraulic	Screwed	. . .	6000	4500	6000

Medium cast steel fittings have the same metal wall and flange thicknesses as the standard, but the face to face, flange diameter and bolting are the same as extra heavy cast iron fittings They are designed for replacement of extra heavy cast iron fittings

The fittings are all good for the steam pressures specified for temperatures up to 800°F. and for these pressures in hot oil or other liquids or gases.

READING STEEL VALVES

Cast steel gate valves, globe and angle valves, check valves and stop and check valves are made for saturated steam service up to 250 lbs. pressure, and for superheated steam service up to 350 lbs. pressure, and for a total temperature up to 800°F. The 350 lbs. steam pressure valves are for 800 lbs. cold water or oil pressure and we also make hydraulic valves for 1500 lbs. and 3000 lbs. working pressure.



45° ELBOW

SCREWED ELBOW

REDMANOL CHEMICAL PRODUCTS CO.

REDMANOL
TRADE MARK REGISTERED

648 West 22nd Street
CHICAGO, ILL.

REDMANOL
TRADE MARK REGISTERED

PRODUCTS

- "Redmanol" Molding Compounds.
- "Redmanol" Electric Insulation.
- "Redmanol" Acid-Proof Paints.
- "Redmanol" Fume-Proof Paints.
- "Redmanol" Transparent (Synthetic Amber).
- "Redmanol" Impregnating Liquids.
- "Redmanol" Insulating Varnishes.
- "Redmanol" Metal Lacquers.
- "Redmanol" Bristle Set Cements.
- "Redmanol" Cements.

"REDMANOL"

"Redmanol" is the synthetic phenol resin which forms when phenol reacts with hexamethylenetetramine in an anhydrous reaction.

PROPERTIES OF "REDMANOL"

- Resistance to extreme heat.
- Exceptionally high dielectric strength.
- Great mechanical strength.
- Excellent acid resistance.
- Unusual accuracy of dimensions.
- Singular beauty of finish.

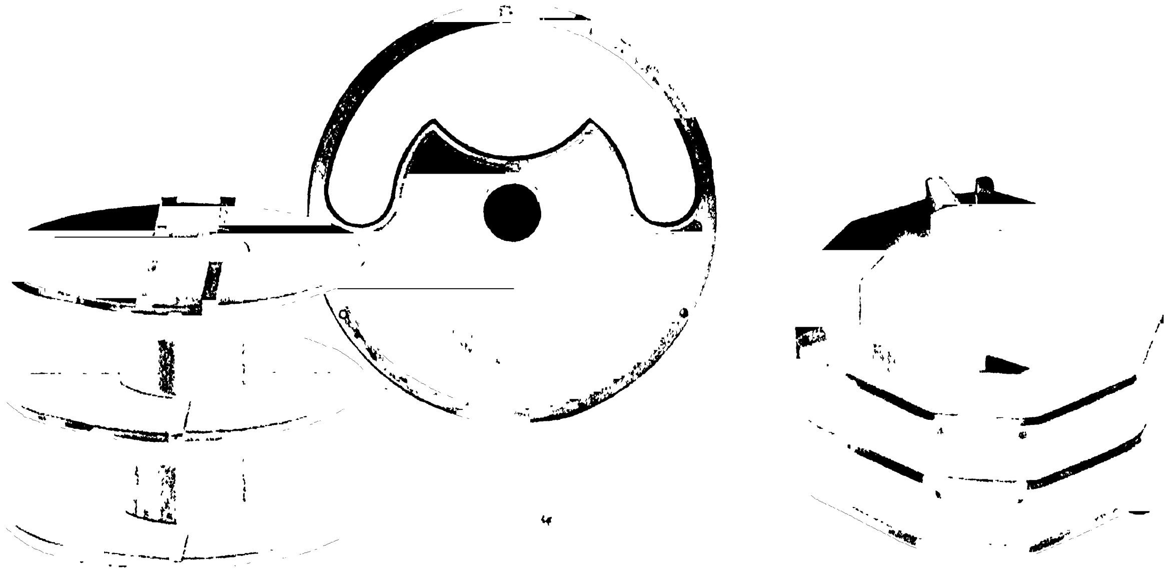
APPLICATIONS

The parts illustrated show only a few of the many applications of "Redmanol."

"Redmanol" is being used today by makers of motor cars, airplanes, wireless telegraph apparatus, telephone equipment, electrical measuring instruments, scientific instruments, billiard balls, umbrella handles, pipes, cigar and cigarette holders, novelties, buttons, etc.

On account of its perfect qualities as a molding compound, notable savings in cost of production are possible through its use. "Redmanol" can often be used to replace parts now requiring careful hand machining and finishing.

Many more manufacturers could advantageously use "Redmanol." Why not get in touch with our laboratories—which are constantly working on new applications—and find out if some of your problems cannot be simplified by "Redmanol"? For this service there is no charge.



MOLDED "REDMANOL" PARTS

THE REFINITE COMPANY

Water Rectification

AND WORKS ore S D REFINITE BUILDING, OMAHA, NEBRASKA EQUIPMENT ASSEMBLING PLANT Omaha, Neb

Member Associated Manufacturers of Water Purifying Equipment

DISTRICT OFFICES

k 1116 Nat'l Assn Bldg
rd Street

Chicago, 908 S Michigan Ave
(Special Display Salesroom)

San Francisco 419 Call Bldg

PRODUCTS

Refinite, **Nature's Water Softener** (zeolite **system). Booth Lime-Soda** Water **Softener. Refinite Rapid Pres**sure **Filter, Gravity Filter.**

REFINITE SYSTEMS

The Refinite system utilizes as a softening agent Refinite, a natural water softening mineral. It attaches to the water supply line. Softening is accomplished as the water passes downward through a bed of Refinite in the container, sodium from the mineral exchanging with the calcium and magnesium hardness The effluent is zero hardness and free from causticity

Renewal—The sodium base of the mineral, when exhausted, is renewed by introducing salt water into the container. The renewal action is the reverse of the softening, sodium from the salt solution exchanging with the calcium and magnesium hardness taken up by the mineral. For industrial uses the systems are built to soften the maximum amount of water needed. Renewal is accomplished over night. The brine solution is then flushed out and the system again ready for a capacity run of soft water.

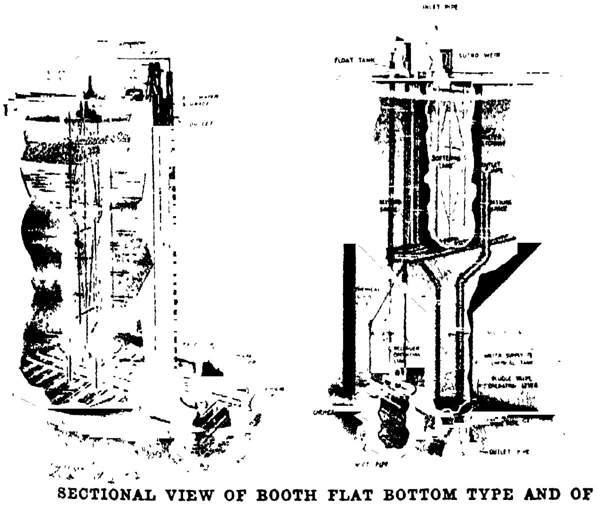
Refinite systems are built in sizes to suit all needs. Two or more units may be connected to increase the total capacity. They occupy very little space. Dependable and accurate in performance. No expert supervision is required, practically no attention; inexpensive to operate; the mineral does not disintegrate.

Refinite Water Softeners are ideal for textile mills and are highly approved by such users as Phœnix Knitting Works, Burson Knitting Mills, Standard Processing Co., Samuel Hird & Son, Hanover Woolen Mills, Pennsylvania Silk Co., California Cotton Mills and many others. Refinite soft water saves more than half the soap in laundries and the laundry department of hotels, hospitals, institutions and similar users. It prevents boiler scale, conserving fuel and saving time, labor and equipment. It is used also in tanneries, ice plants, machine shops, food factories, cafes, beauty parlors and homes

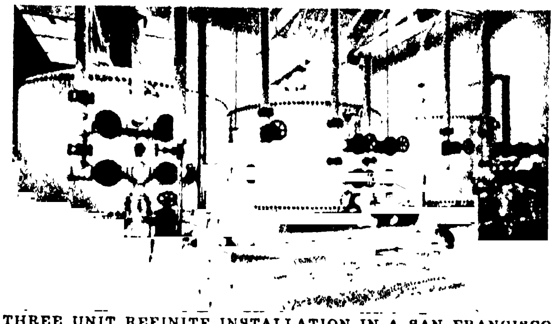
REFINITE
RIVAL OF THE CLOUDS
TRADE MARK

Nature's Water Softener

Copyright 1920—The Refinite Co.



SECTIONAL VIEW OF BOOTH FLAT BOTTOM TYPE AND OF BOOTH CONI-SPHERICAL TYPE WATER SOFTENER



THREE UNIT REFINITE INSTALLATION IN A SAN FRANCISCO, CALIF., LAUNDRY

REFINITE RAPID PRESSURE FILTER, GRAVITY FILTER

Standard types built in sizes to suit individual needs. Used for removal or reduction of impurities and substances other than calcium and magnesium.

BOOTH LIME-SODA WATER SOFTENERS

Continuous type, using milk-of-lime and soda ash. Capacities ranging from 500 gals. per hour upward. Used extensively by railroads and the larger steam power and central heating plants. It is built in two styles, flat bottom and coni-spherical tank. The Booth system is the first water softener ever built where continuous feeding and proportional regulation of chemicals are accomplished at the ground level. Large softening tank, ample sedimentation tank. Chemical reagent tank holds supply for 14 hour run at maximum speed; agitators prevent lime from settling. Chemical feed regulator controlled by flow of incoming water, and measures uniform amount of chemical solution regardless of fluctuations in supply or use of water. Operating power obtained from incoming water passing over an overshot wheel or from electric motor, gas or steam engines.

GUARANTEES, LITERATURE

Each Refinite or Booth installation is built and installed to give absolute satisfaction, to accomplish definite results at a definite cost, and each sale is conditioned on the apparatus fulfilling these guarantees. A staff of competent chemists and engineers is maintained to work with prospective purchasers. Water analysis, investigations, estimates, reports and designs furnished for industrial and municipal softening or purifying plants. Full descriptive literature furnished on request.

RELIANCE ELECTRIC & ENGINEERING COMPANY

Established 1905

MAIN OFFICE AND WORKS

1060 IVANHOE ROAD, CLEVELAND, OHIO

BRANCHES

Boston, 200 Devonshire St
New York, 16 Dey St
Philadelphia, Pennsylvania Bldg
Pittsburgh, 411 House Bldg
Cincinnati, 1700 Union Trust Bldg
Detroit, 601 Temple Bldg
Chicago, 313 S. Dearborn St

PRODUCTS

- Direct Current Motors
- Direct Current Generators up to 100 k.w.
- Alternating Current Motors 2 and 3 phase
- Motor-Generator Sets

TYPE T HEAVY DUTY RELIANCE MOTORS

For Direct-Current. Constant and adjustable speed duty.

Thirty-five electrical engineers who have watched motors operating under the worst conditions co-operated with us in the design of Type T motors. The result of this unusual combination of engineering knowledge is a motor that will stand harder work and stand it longer than the ordinary motor. The added strength and quality built into Type T motors make them particularly suited for operation in plants where the service is severe and the operating conditions unfavorable.

These motors are built in sizes up to 150 h.p. They can be supplied open, semi-enclosed or fully-enclosed and with shunt, compound or series windings. Rated on 40°C. basis.

RELIANCE INDUCTION MOTORS

Unusual care is taken in preparing the windings of Reliance Motors to resist the destructive action of dust, moisture, oil and acids. This extra precaution is a big factor in insuring continuous and satisfactory operation in chemical plants, textile mills, paint factories and for all pumping service

Motors are supplied for two and three phase circuits in both squirrel cage and slip ring types. All standard voltages, frequencies, and speeds.

MOTOR-GENERATOR SETS

These sets can be furnished for battery charging, lighting and general power purposes in sizes up to 100 k.w.

TYPE AS RELIANCE ADJUSTABLE SPEED MOTORS

Armature Shifting Design. For Direct Current.

These motors provide unlimited running speeds over ranges as great as 1.10. Changes in speed are obtained by shifting the motor armature. No electric controller is used Horse-power output is same at all speeds. These motors are particularly suited for work requiring accurate speed adjustments over wide ranges. Sizes up to 40 h.p.

TYPE AS ADJUSTABLE SPEED MOTOR

We shall be glad to submit complete eviden the quality of materials and workmanship in Re Motors and the satisfaction which they are gi many large industrial plants.

TYPE T HEAVY DUTY D. C. MOTOR

TYPE AA SQUIRREL CAGE INDUCTION MOTOR

A. C.—D. C. MOTOR-GENERATOR SET

RESEARCH CORPORATION

Engineers, Consultants, Constructors
Cottrell Electrical Precipitation Processes
25 WEST 43d STREET, NEW YORK, N. Y.
343 S. DEARBORN STREET, CHICAGO, ILL

SERVICE

Design, construct, install and license installations of the Cottrell Electrical Precipitation Processes for the removal and collection of dust, fumes, acid mist, tar, etc., from air and other gases.

Make investigations and reports on dust and fume losses in metallurgical, chemical, and other manufacturing plants.

Render consulting and general engineering services for plant or process design and construction.

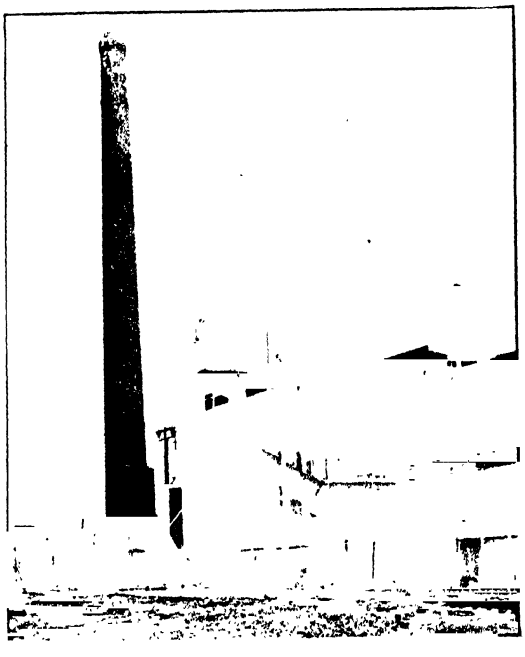
Investigate and develop new processes in cooperation with inventors, patentees, etc.

INDUSTRIAL ENGINEERING

We design and construct parts of or complete plants for various industrial purposes—metallurgical plants, oil refining, sulphur dioxide removal, acid recovery, ventilating, etc.

NEW PROCESSES

Research Corporation is organized to investigate and exploit new and undeveloped processes cooperatively with the inventors and industry.



COTTRELL PRECIPITATOR REMOVING DUST AND FUMES FROM TIN DROSS FURNACE GASES
Constructed by Research Corporation

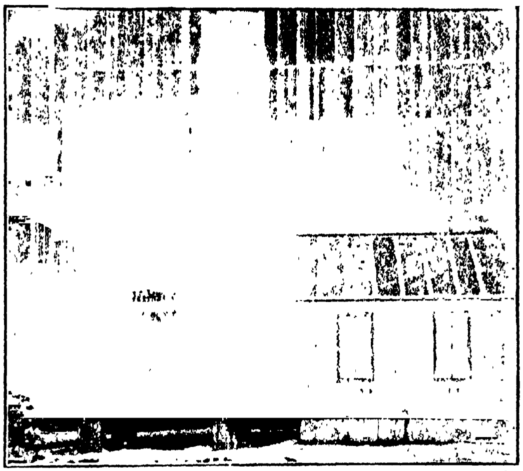
COTTRELL PROCESSES

The Research Corporation owns and controls the rights to the Cottrell Electrical Precipitation Processes throughout the United States, excepting the six Western States of Washington, Oregon, California, Idaho, Nevada and Arizona, and with the exception of the application of these processes in Portland Cement Factories throughout the country.

We design and construct plants, furnish and install all apparatus necessary for use with the Cottrell Electrical Precipitation Processes for a contract price. All such installations are licensed by Research Corporation.

If deemed desirable, small scale tests can be made prior to the erection of a commercial installation, for which purpose we rent clients the necessary electrical equipment and furnish an engineer for making such tests. Fees for such services will be quoted on request.

Address all communications to Research Corporation, Attention of Precipitation Department



COTTRELL PRECIPITATOR REMOVING ACID MIST FROM CONCENTRATOR GASES
Constructed by Research Corporation

TYPICAL APPLICATIONS

Collecting and recovering fumes and dust from the gases from: Sintering machines, reverberatory smelting and refining furnaces, lead and copper blast-furnaces copper converters, drying, roasting and calcining kilns, brass-melting furnaces, etc.

Cleaning iron blast-furnace gas, recovering potash, manganese and other values.

Cleaning gases from electric furnaces producing carbide and ferro-alloys.

Removal of tar and oils from producer, coke-oven and illuminating gas, wood distillation, etc.

Removing acid mists and fumes from gases given off by:

Sulphuric acid concentrators, sludge acid concentrators, nitrating operations, pickling vats, etc.

Cleaning hot gases from pyrites and zinc blende roasting furnaces for sulphuric acid manufacture.

Cleaning air drawn from buildings and rooms in which grinding, buffing and similar operations are carried on as well as from tumbling barrels and sand-blast rooms in foundries.

Recovering powdered food products from spray evaporating processes, etc.

RICE & ADAMS CORPORATION

Manufacturers of Power Washing Machinery

Main Office and Factory
BUFFALO, N. Y.

SALES OFFICES
New York Boston Chicago

PRODUCTS

Power washing machinery for all kinds of containers and utensils used in the handling of chemicals and allied products, designed and built to your special order providing they come within the limits of size. Among the purposes for which Rice & Adams Power Washing Machinery have been built are the following:

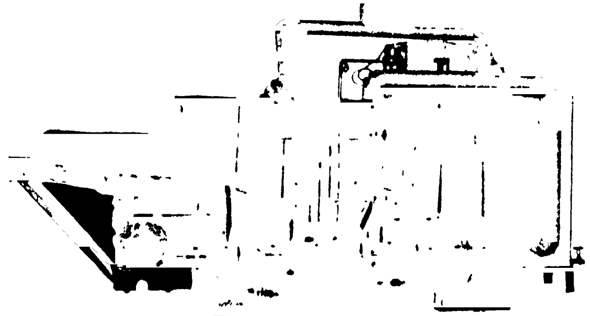
- Medicine bottles
- Battery jars
- Metal Parts washers
- Aluminum Ware washers
- Garbage can washers
- Chocolate Molds
- Biscuit tins
- Preserve jars
- Catsup bottles
- Salad bottles
- Ice Cream cans
- Water bottles
- Beverage bottles
- Milk bottles
- Milk cans

PROCESS

In Rice & Adams Power Washing Machinery the bottles, cans or containers are first washed with washing solution under hydraulic pressure, rinsed with boiling hot water, sterilized with live steam and thoroughly dried with blasts of hot air.

USERS

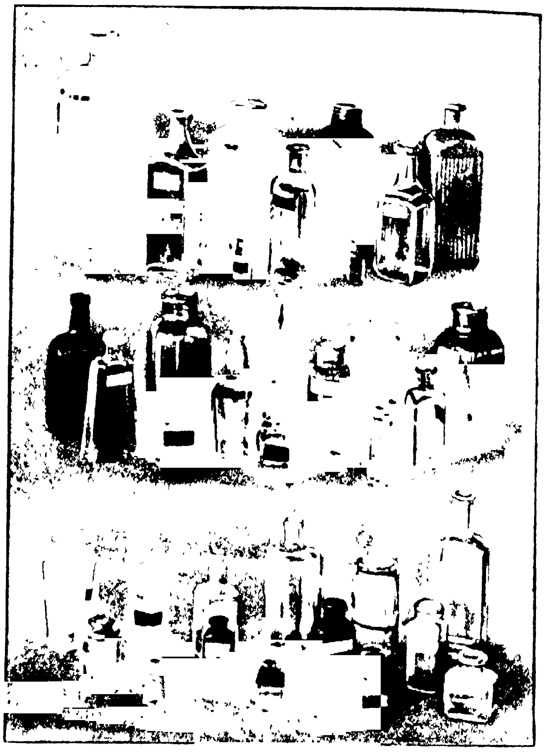
- U. S. Aluminum Company
- Electric Storage Battery Co.
- United Drug Company
- Loose-Wiles Biscuit Company
- Libby, McNeil & Libby
- Armour Packing Company
- Van Camp Packing Company
- Nestlé's Food Company
- Borden's Condensed Milk Company
- Walter Baker Chocolate Company



ONE OF THE TYPES OF RICE & ADAMS POWER WASHING MACHINES

EXPERIMENTAL DEPARTMENT

Our experimental department will be glad to advise you if the bottle, can or container you have to wash can be successfully handled with a power washing machine. This department has designed widely different types of power washing machinery for various purposes. It has solved the washing problem for manufacturers in other lines—helped them to obtain more sanitary containers—to reduce costs and save time. Maybe it can do the same for you.



A FEW SAMPLES OF THE 128 DIFFERENT TYPES OF BOTTLES WHICH ONE RICE & ADAMS MACHINE IS WASHING FOR THE UNITED DRUG COMPANY

SAMPLES OF ALUMINUM WARE WASHED BY A RICE & ADAMS MACHINE; USED BY THE U. S. ALUMINUM COMPANY

RIEHLÉ BROS. TESTING MACHINE COMPANY

Established 1865

Cable Address
[illegible] Philadelphia

Manufacturers of Testing Machines

1424 N. 9TH STREET, PHILADELPHIA, PA., U. S. A.

Codes Used
ABC 4th Edition
Lieber's

FOREIGN REPRESENTATIVES

England A Macklow-Smith

France—Allied Machinery Co

Spain Puig & Co

PRODUCTS

Testing Machines, including:

Testing machinery and instruments for determining the physical characteristics of all materials. Universal testing machines, special testing machines for hardness, torsion, impact, bending, and alternate stress testing. Special testing machines for cement, concrete, fabric, cloth, twine, paper, rubber, leather, oils, grease and bearing metal. Also testing machines for molded insulating material, springs, wire, rope, chain, anchors, iron, steel, road materials, etc. Special efficiency testing machines for determining the property of all tools Special milling machines for preparing test specimens, pumps, viscosimeters, presses, accumulators, etc.

EXPERIENCE AND FACILITIES

The Riehlé Bros. Testing Machine Company was founded in 1865. Its engineering staff has a broad and varied experience in the design and construction of testing machinery. The plant in Philadelphia is fully equipped for the production of standard and special testing machines of all kinds.

TESTING LABORATORY AND RESEARCH DEPARTMENT

The Company's testing laboratory is located at the works in Philadelphia. It has been in operation since 1866, and is the oldest physical testing laboratory in the United States.

In this laboratory the Company is prepared to make all kinds of tests and investigations, and develop new methods of testing and suitable machines for the purpose

Special problems requiring the development of new methods of testing and new designs of testing machines will be placed in the hands of expert engineers, who have had long experience in this class of work As a large portion of the Company's business consists of designing and building special machines, it is often possible to meet usual requirements by slight alteration of an existing design.

Companies purchasing materials in the United States will find it advantageous to have tests of specimens made in the Riehlé laboratory. Carefully compiled confidential reports will be made on the results of such tests.

USERS OF RIEHLÉ TESTING MACHINES

Riehlé testing machines are in use in the laboratories of many governments, universities, railroads, and manufacturing concerns in America and abroad The following are a few of the users of Riehlé machines

U S. **Government**—Bureau of Standards; Isthmian Canal Commission, Navy Department, Naval Aircraft Factory

Other **Governments**—Argentine Republic; China, Government Institute of Technology; England, Royal Aircraft Factory, Japan, Osaka Military Arsenal and Yokosuka Navy Yard

Technical Schools in the United States—University of Illinois, Lehigh University, Massachusetts Institute of Technology, Johns Hopkins University, Yale University

Technical Schools in Other Countries—Australia, Sydney Technical College; Canada, Montreal Technical School, Universities of Alberta and Saskatchewan, England, City and Guilds College, Imperial Institute, Hightown Technical Institute, Croyden Polytechnic and the Verdin Technical School; Hawaii, College of Hawaii, India, College of Poona, Porto Rico, University of Porto Rico, Turkey, Robert College

RIEHLÉ BROS. CATALOGS

The Riehlé Bros. Testing Machine Company build several hundred types and sizes of standard testing machines. For the convenience of prospective customers these machines have been grouped according to similarity, and a catalog issued for each class of equipment. Each catalog is given a code word so that prospective customers may request copies by cable.

Catalog "A"—Illustrates and describes all the larger standard testing machines, two rotating screw, three rotating screw, three rotating nut, and four rotating nut types of vertical screw power testing machines, with new and special appliances for use with them Also hydraulic machines for tensile, compression and transverse strains and machines for torsion, impact, repeated stress, and cold bend strains Brinell hardness machines, brake beam, staybolt testers and specimen millers Code word TESTMACHCAT

Catalog "AA"—Extensometers, compressometers, torsion meters, deflectometers, etc Code word SUPCATA

Catalog "B"—Small machines for testing fabric, wire, twine, rubber, springs, etc Code word TESTCATWIRE

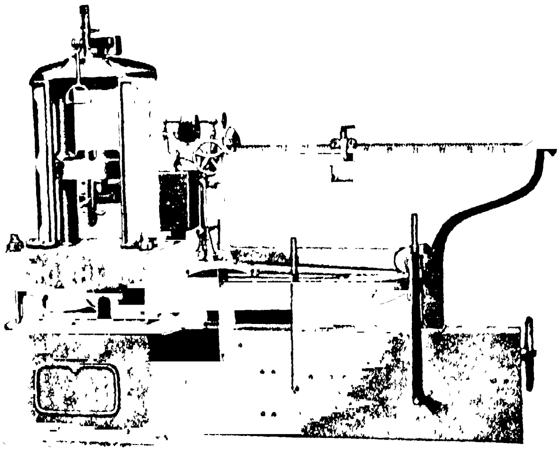


FIG 1—UNIVERSAL TESTING MACHINE

Catalog "C"—Machines for testing anchors, chain, wire, rope, eye-bars, etc Code word CHAINTM

Catalog "D"—Testing machines for foundries, transverse testers, pipe provers, hay rope twisters, etc Code word. TESTCATRAN.

Catalog "E"—Testing machines for heavy springs used by railways, rapid testers for automobile springs, small machines for light springs, oil and bearing metal testers Code word SPRINGOILTM

Catalog "F"—Hand and power operated hydraulic pumps and presses, also Riehlé-Robie patented screw jacks, etc Code word. CUTOTHER

Catalog "G"—Machines and apparatus for testing cement and concrete, automatic shot cement testers, compression and transverse machines, molds, sieves, and laboratory equipment Code word CEMASPTM

Catalog "K 1"—Illustrates and describes complete outfits for making laboratory tests on road materials as used by the U S Government Department of Public Roads. Code word: GOVEMTR.

H. H. ROBERTSON COMPANY

PITTSBURGH, PA.

FACTORIES

Ambridge, Pa , Waltham, Mass , Akron, N Y , Sarnia, Ont

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Allentown, Pa.
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Easton Pa

Indianapolis Ind
Little Rock, Ark
Minneapolis, Minn
Nashville Tenn
New York N Y
Philadelphia, Pa

Portland, Ore
San Francisco, Cal
Scranton Pa
Seattle, Wash
St Louis Mo

EXPORT DIVISION 170 Broadway, NEW YORK, N Y

FOR CANADA

H. H. ROBERTSON CO., LIMITED

Sarnia, Toronto, Montreal, Vancouver, Winnipeg, St John, N. B , Halifax, N S , St John's, N F

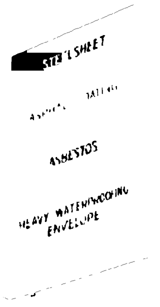
PRODUCTS

Robertson Process Metal: Flat, Corrugated, and Mansard Sheets for Roofing, Siding, Flashings, Ridge Caps, Louvers, Gutters, Downspouts, Robertson Process Ventilators, Robertson Process Skylights, and Robertson Process Mineral Rubber.

Trade Mark

ROBERTSON PROCESS METAL

A metal building material which is fully protected from the most severe weather conditions, smoke, gases, fumes, acids, alkalies, condensation and salt sea air, by means of three impervious coatings—(1) Asphalt, (2) Asbestos, (3) Waterproofing. It is made for use in the chemical industry as roofing, siding, downspouts, gutters, general building trim, skylights and ventilators. This metal is low in first cost when compared with other permanent materials, and involves no maintenance or depreciation charges. It is both rust-proof and corrosion-proof.



ROBERTSON PROCESS OF METAL PROTECTION

Robertson Process—The body or core is special annealed steel. It is thoroughly cleansed and immersed in a bath of special asphaltic compound. The asphalt is in turn protected by a tough, opaque and insulating covering of asphalt-saturated asbestos felt which completely covers every surface of the metal and is applied while the asphalt is hot. **The steel is hermetically sealed.** Both surfaces and edges are fully protected. The asphalt coat provides permanent protection to the metal against the corrosive influences of moisture and fumes. The asbestos protects the asphalt from mechanical abrasion. It also prevents evaporation and carbonization of this natural life-preserving product. Because of its fibrous rock character, asbestos is indestructible. It cannot rot or decay. Acids and alkalies cannot affect it.

Finally the asbestos itself is protected by a new and original process of waterproofing, which imparts a tough, smooth, repellent surface. This waterproofing treatment also provides power of resistance to mechanical abrasion, permitting the sheets to be handled freely in shipment and erected without regard to weather temperatures.

Forms and Colors—Robertson Process Metal is made in corrugated, and mansard roofing and siding sheets, as well as in flat sheets and is furnished in black or maroon.

All necessary materials needed in fastening, such as nails, rivets, straps, bolts, etc., can be supplied.

Advantages to Chemical Industry—Robertson Process Metal is light and strong. It weighs little more per square foot than corrugated iron and at all times retains the strength of the original metal, since it suffers no loss of efficiency by corrosion or other forms of deterioration. **It is corrosion-proof and rust-proof.** It has stood severe tests on all kinds of industrial buildings and is used and indorsed by industrial engineers throughout the country. The fact that it is immune to the corroding action of gases, acid and alkali fumes, all weather conditions and salt sea air, makes it exceptionally well suited to permanent building construction.

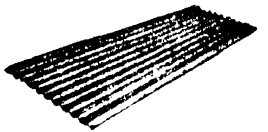
The insulating qualities of this metal greatly reduce

Continued on Next Pag

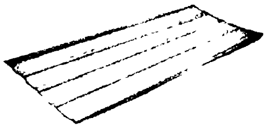
ency toward condensation of moisture. Build- which it is used are drier, and easier to heat ., and remain cooler and more comfortable in . It is also proof against galvanic action. Its ght, ease of erection, strength and permanency construction as a whole less costly by com- with other permanent building materials. more, first cost is the total cost.

For Replacement—The fact that old roofs and of ordinary corru- metal need replac- so short a time the need for a bet- material It shows unprofitable the un- tected metal has been low its maintenance, ating and its upkeep ts have piled up and in the long run it has an expensive invest- ment

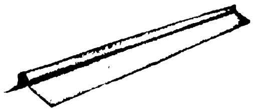
Robertson Process Metal will serve as a permanent replacement. Almost invariably it has outlived unprotected metal by such a wide margin that roof costs over a period of years have been cut in half. Hundreds of times it has replaced old roofs and siding and put an end to wasteful corrosion losses and repair costs. Maintenance and upkeep costs have thus been reduced to a minimum. It can be so quickly and easily erected that replacement operations can be completed without interrupting production.



ROBERTSON PROCESS METAL CORRUGATED SHEET



ROBERTSON PROCESS METAL MANSARD SHEET



ROBERTSON PROCESS METAL RIDGE CAP

Money and time are saved by designing buildings to use standard type Robertson Process Metal corrugated sheets. They are 28″ wide, have corrugations 2⅝″ wide and are carried in stock in lengths of even feet from 5′ to 12′. Their net covering width is 24″ with one and one half corrugations side lap.

Purlin and Girt Spacings—For Corrugated Sheets on roof structures having a rise of 4″ or more in 12″, purlins may be spaced as follows

No. 26 gauge for spans up to 3′9″ centers
No. 24 gauge for spans up to 4′9″ centers
No. 22 gauge for spans up to 5′9″ centers
No. 20 gauge for spans up to 6′6″ centers
No. 18 gauge for spans up to 7′6″ centers

Corrugated Robertson Process Metal Sheets for Siding, girts may be spaced as follows

No. 26 gauge for spans up to 3′10″ centers
No. 24 gauge for spans up to 4′10″ centers
No. 22 gauge for spans up to 5′10″ centers
No. 20 gauge for spans up to 6′ 8″ centers

Evidence in the Chemical Industry—Many of the country's largest chemical manufacturers have found

WEIGHT OF ROBERTSON PROCESS METAL IN POUNDS PER 100 SQUARE FEET OF MATERIAL AREA

Gauge	Corrugated or Mansard				Flat			
	Net Weight		For Crated Shipments Add		Net Weight		For Crated Shipments Add	
	Black	Maroon	Domestic	Export	Black	Maroon	Domestic	Export
26	138	144	14	20	128	134	10	16
24	165	171	15	21	154	160	11	17
22	192	198	16	22	179	185	12	18
20	218	224	17	24	204	210	13	21

WEIGHT IN POUNDS PER LINEAL FOOT OF ROBERTSON PROCESS METAL FLASHING

Gauge	Girth in Inches							Gauge							
	6″	7½″	10″	12″	15″	24″	30″		6″	7½″	10″	12″	15″	24″	30″
26	7	88	1.16	1.4	1.75	2.8	3.5	22	1.0	1.25	1.67	2.0	2.50	4.0	5.0
24	8	1	1.33	1.6	2.00	3.2	4.0	20	1.2	1.50	2.00	2.4	3.00	4.8	6.0

Note All weights subject to variations

LENGTH OF PURLINS OR DISTANCE BETWEEN TRUSSES

Spacing of Purlins	12′		14′		16′		18′		20′		22′	
	⊏	I	⊏	I	⊏	I	⊏	I	⊏	I	⊏	I
[illegible]	4″-5¼ lb	4″-7½ lb	5″-6¼ lb	4″- 7½ lb	6″- 8 lb	5″- 9¾ lb	7″- 9¾ lb	5″- 9¾ lb	7″- 9¾ lb	6″-12¼ lb	8″ 11¼ lb	6″ 12¼ lb
4′ 4″	5″-6½ ″	4″-7½ ″	6″ 8 ″	5″- 9¾ ″	6″- 8 ″	5″- 9¾ ″	7″- 9¾ ″	6″ 12¼ ″	8″-11¼ ″	6″-12¼ ″	8″-11¼ ″	7″ 15 ″
4′ 10″	5″-6½ ″	4″-7½ ″	6″-8 ″	5″- 9¾ ″	7″- 9¾ ″	5″ 9¾ ″	7″ 9¾ ″	6″ 12¼ ″	8″-11¼ ″	6″ 12¼ ″	9″ 13¼ ″	7″ 15 ″
5′ 4″	5″ 6½ ″	4″ 7½ ″	6″-8 ″	5″- 9¾ ″	7″- 9¾ ″	6″-12¼ ″	8″ 11¼ ″	6″ 12¼ ″	8″-11¼ ″	7″ 15 ″	9″ 13¼ ″	7″ 15 ″
5′ 10″	5″-6½ ″	4″-7½ ″	6″-8 ″	5″- 9¾ ″	7″ 9¾ ″	6″ 12¼ ″	8″ 11¼ ″	6″-12¼ ″	9″ 13¼ ″	7″ 15 ″	10″ 15 ″	8″ 17½ ″
6′ 4″	6″-8 ″	5″-9¾ ″	7″-9¾ ″	5″- 9¾ ″	7″- 9¾ ″	6″-12¼ ″	8″ 11¼ ″	7″-15 ″	9″-13¼ ″	7″ 15 ″	10″-15 ″	8″-17½ ″
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7′ 4″	6″-8 ″	5″-9¾ ″	7″-9¾ ″	6″ 12¼ ″	8″-11¼ ″	6″-12¼ ″	9″ 13¼ ″	7″-15 ″	10″ 15 ″	8″-17½ ″	12″-20½ ″	8″-17½ ″
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Maximum unit bending stress, 16,000 pounds per square inch
Dead load equals weight of Robertson Process Metal corrugated roofing and purlins, from 3½ to 6 pounds per square foot.
Live load equals 40 pounds per square foot on horizontal surface
Pitch of roof, 6 inches per foot
If purlins are trussed, lighter sections may be used.

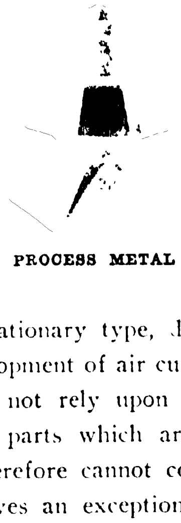
Continued on Next Page

that Robertson Process Metal is the only material of its kind that will withstand the severe conditions which result from the various processes of chemical production. Evidence of this will be found in the number of manufacturers who have used it repeatedly for their building operations during the last twelve years. Robertson Products are serving these manufacturers by greatly reducing maintenance and up-keep costs and prolonging the life of their buildings. The following list is significant because all of them have repeatedly used Robertson Process Metal.

	First Order	
Butterworth Judson Corporation	1915	22 orders
Davison Chemical Company . . .	1908	73 orders
E I du Pont de Nemours and Company	1909	50 orders
General Chemical Company . . .	1909	119 orders
General Carbonic Company .	1919	4 orders
The Koppers Company .	1918	86 orders
Roessler & Hasslacher Chemical Company	1909	11 orders
F S Royster Guano Company	1910	35 orders
The Semet Solvay Company	1910	63 orders
The Sherwin Williams Company . .	1916	5 orders
The Standard Guano Company . . .	1916	16 orders
The Standard Oil Co and Subsidiaries . .	1912	100 orders

ROBERTSON PROCESS VENTILATOR

This Robertson product is built completely of Robertson Process Metal and will withstand the most severe gases, fumes, smoke, etc., from the inside and all weather conditions from the outside. All up-keep expense is eliminated. It cannot get out of order.



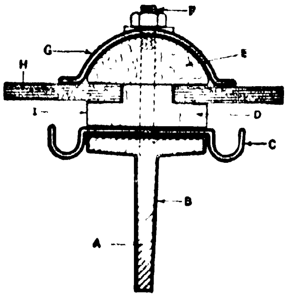
ROBERTSON PROCESS METAL VENTILATOR

It is of the stationary type, designed to provide the greatest development of air current under all conditions. It does not rely upon mechanical adjustment or moving parts which are not permanently operative and therefore cannot continue to function efficiently. It gives an exceptionally large, definite and reliable exhaust capacity under the most adverse conditions.

It is made in a variety of sizes with special to meet all requirements.

ROBERTSON PROCESS SKYLIGHT AND SASH

Robertson skylight and sash is a patent typ construction, the long life of which is due to th of Robertson Process Metal and Robertson Pro Asphalt. It is a form of construction that cannot rode or rust and does not require painting. The danger from broken glass through corrosion and deflection of supporting bars and the expense of such breakage is entirely eliminated.



CROSS SECTION OF ROBERTSON PROCESS METAL SKYLIGHT CONSTRUCTION

Bars, condensation gutters, and caps are made of Robertson Process Metal. Skylights constructed of metal, so protected, will have many years added to their life and much up-keep expense will be eliminated Robertson Process asphalt is used for the skylight cushions and fillers. This special asphalt provides a resilient, non-absorbent, permanent, and insulating bed for the glass. It positively keeps the glass from contact with hard substances and prevents destructive strains.

ROBERTSON POLICY

In order to insure the proper use of Robertson Process building materials, this company has at times found it necessary to undertake the erection of its material where competent workmen were not available.

A corps of engineers and chemists is maintained, which is at all times prepared to assist manufacturers, contractors, architects, and plant officials. With offices in all important cities in the United States, as well as in Canada and other foreign countries, prompt and adequate service is available.

Catalogs covering in detail the various Robertson products will gladly be sent on request.

ency toward condensation of moisture. Build- which it is used are drier, and easier to heat , and remain cooler and more comfortable in It is also proof against galvanic action. Its ght, ease of erection, strength and permanency construction as a whole less costly by com- with other permanent building materials. more, first cost is the total cost.

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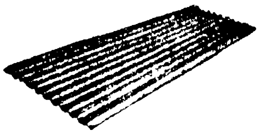
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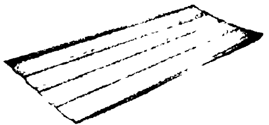
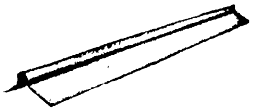

ROBERTSON PROCESS METAL MANSARD SHEET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Evidence in the Chemical Industry—Many of the country's largest chemical manufacturers have found

WEIGHT OF ROBERTSON PROCESS METAL IN POUNDS PER 100 SQUARE FEET OF MATERIAL AREA

Gauge	Corrugated or Mansard				Flat			
	Net Weight		For Crated Shipments Add		Net Weight		For Crated Shipments Add	
	Black	Maroon	Domestic	Export	Black	Maroon	Domestic	Export
26	138	144	14	20	128	134	10	16
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20	218	224	17	24	204	210	13	21

WEIGHT IN POUNDS PER LINEAL FOOT OF ROBERTSON PROCESS METAL FLASHING

Gauge	Girth in Inches 6″	7½″	10″	12″	15″	24″	30″	Gauge	6″	7½″	10″	12″	15″	24″	30″
26	7	88	1 16	1 4	1 75	2 8	3 5	22	1 0	1 25	1 67	2 0	2 50	4 0	5 0
24	8	1	1 33	1 6	2 00	3 2	4 0	20	1 2	1 50	2 00	2 4	3 00	4 8	6 0

Note All weights subject to variations

LENGTH OF PURLINS OR DISTANCE BETWEEN TRUSSES

Spacing of Purlins	12′		14′		16′		18′		20′		22′	
	[	I	[	I	[	I	[	I	[	I	[	I
3′ 10″	4″-5¼ ℔	4″-7½ ℔	5″-6¼ ℔	4″- 7½ ℔	6″- 8 ℔	5″- 9¾ ℔	7″- 9¾ ℔	5″- 9¾ ℔	7″- 9¾ ℔	6″-12¼ ℔	8″ 11¼ ℔	6″ 12¼ ℔
4′ 4″	5″-6½ ″	4″-7½ ″	6″ 8 ″	5″- 9¾ ″	6″- 8 ″	5″- 9¾ ″	7″- 9¾ ″	6″ 12¼ ″	8″-11¼ ″	6″-12¼ ″	8″-11¼ ″	7″ 15 ″
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5′ 4″	5″ 6½ ″	4″ 7½ ″	6″-8 ″	5″- 9¾ ″	7″- 9¾ ″	6″-12¼ ″	8″ 11¼ ″	6″ 12¼ ″	8″-11¼ ″	7″ 15 ″	9″ 13¼ ″	7″ 15 ″
5′ 10″	5″-6½ ″	4″-7½ ″	6″-8 ″	5″- 9¾ ″	7″ 9¾ ″	6″ 12¼ ″	8″ 11¼ ″	6″-12¼ ″	9″ 13¼ ″	7″ 15 ″	10″ 15 ″	8″ 17½ ″
6′ 4″	6″-8 ″	5″-9¾ ″	7″-9¾ ″	5″- 9¾ ″	7″- 9¾ ″	6″-12¼ ″	8″ 11¼ ″	7″-15 ″	9″-13¼ ″	7″ 15 ″	10″-15 ″	8″-17½ ″
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Dead load equals weight of Robertson Process Metal corrugated roofing and purlins, from 3½ to 6 pounds per square foot.
Live load equals 40 pounds per square foot on horizontal surface
Pitch of roof, 6 inches per foot
If purlins are trussed, lighter sections may be used.

Continued on Next Page

CHARLES A. ROOS, INC.

FOUNDED IN 1860 AS AUGUST ROOS' SON

Manufacturers of Chemical Equipment of Copper
429-431-433 EAST 91st STREET, NEW YORK, N. Y.

Tel.:
Lenox

PRODUCTS

Chemical Coppersmithing, including construction of:

- **Condensers and Coils**
- **Crystallizing Pans**
- **Distilling Machinery**
- **Extractors**
- **Heat Exchanging and Cooling Apparatus**
- **Kettles of all kinds**
- **Percolators**
- **Pipe and Fittings**
- **Stirrers**
- **Subliming Pans**
- **Tanks of all kinds**
- **Vacuum Pans**
- **Varnish Kettles**

Stills, Condensers and all other equipment for preparing and purifying Essential Oils.

We are also prepared to do work partly or entirely tin or silver-lined; also work in sheet Aluminum, Brass, Monel metal, etc.

SERVICE

We will always be pleased to figure on your requirements in our line. Wherever possible submit blueprints or sketches and make explanations as detailed as possible. When desired we will submit suggestions for equipment and in every way possible cooperate with your own engineers or chemists in carrying out their ideas.

TIN AND SILVER-LINED EQUIPMENT

For a number of years we have been building various pieces of chemical equipment requiring linings of tin, silver and other metals.

In doing this work we have greatly improved on the ordinary methods in use, with the result that all of this class of equipment which we have supplied has proved unusually satisfactory in operation.

We feel confident now of our ability to deal with the most difficult problems in this kind of construction. We will be pleased to quote on kettles, stills, digesters, subliming pans, etc.

DISTILLING EQUIPMENT

Stills for various purposes have always formed a large part of our output. We have built stills for alcohol, solvents, essential oils, various organic chemicals, acids, etc.

Some of these have been simple stills, and some have been supplied with rectifying columns, dephlegmators, etc.

We design and build Stills for operation under atmospheric pressure, increased pressure or vacuum.

Any of our stills can be supplied with special stirring and agitating equipment, special openings, etc., and equipped with various types of condensers and receivers.

Users of our stills have found that our more than usually strong construction pays in the long run by eliminating repairs and shutdowns.

We are prepared to undertake the construction of modern distilling equipment for any purpose.

CONCENTRATING AND EVAPORATING EQUIPMENT

We are prepared to construct a variety of evaporators, single and multiple effect, and vacuum pans suitable for concentrating and evaporating solutions, waste liquors, etc. Also evaporating equipment for supplying distilled water to power plants and chemical works.

VARNISH KETTLES

We are large manufacturers of Varnish Kettles. We regularly make two types, one entirely made of copper and one of aluminum with copper bottom.

CLAUSSEN CONTINUOUS BENZINE AND GASOLINE RECOVERY STILLS

Made in standard sizes; 50 to 500 gals. per hour

Suitable for recovering gasoline and other volatile solvents used for cleaning, extracting, removing grease, etc.

SOME OF OUR SATISFIED CUSTOMERS

The Barrett Co.
F. Bredt & Co.
British American Chemical Co.
Calco Chemical Co.
Chas. Pfizer Co.
Chas. F. Squibb
Fries & Fries
General Chemical Co.
Hercules Powder Co.
Heyden Chemical Co.
International Paper Co.
Lehn & Fink
McKesson & Robbins
Melville-Corbett Co.
Merck & Co.
Mutual Chemical Co. of America
Norvell Chemical Co.
Organic Salt and Acid Co.
Pharma Chemical Co.
Toch Bros.
United Piece Dye Works
Warner & Co.
West Virginia Pulp & Paper Co.
West Virginia Waste Wood Chemical Co.
Zinsser & Co.

ency toward condensation of moisture. Build- which it is used are drier, and easier to heat ter, and remain cooler and more comfortable in It is also proof against galvanic action. Its ght, ease of erection, strength and permanency construction as a whole less costly by com- with other permanent building materials. more, first cost is the total cost.

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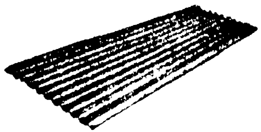
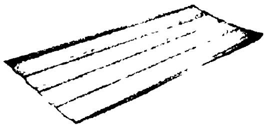
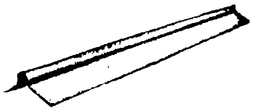


ROBERTSON PROCESS METAL CORRUGATED SHEET



ROBERTSON PROCESS METAL MANSARD SHEET



ROBERTSON PROCESS METAL RIDGE CAP

Robertson Process Metal will serve as a permanent replacement. Almost invariably it has outlived unprotected metal by such a wide margin that roof costs over a period of years have been cut in half. Hundreds of times it has replaced old roofs and siding and put an end to wasteful corrosion losses and repair costs. Maintenance and upkeep costs have thus been reduced to a minimum. It can be so quickly and easily erected that replacement operations can be completed without interrupting production.

Money and time are saved by designing buildings to use standard type Robertson Process Metal corrugated sheets. They are 28″ wide, have corrugations 2⅝″ wide and are carried in stock in lengths of even feet from 5′ to 12′. Their net covering width is 24″ with one and one half corrugations side lap.

Purlin and Girt Spacings—For Corrugated Sheets on roof structures having a rise of 4″ or more in 12″, purlins may be spaced as follows

No. 26 gauge for spans up to 3′9″ centers
No. 24 gauge for spans up to 4′9″ centers
No. 22 gauge for spans up to 5′9″ centers
No. 20 gauge for spans up to 6′6″ centers
No. 18 gauge for spans up to 7′6″ centers

Corrugated Robertson Process Metal Sheets for Siding, girts may be spaced as follows

No. 26 gauge for spans up to 3′10″ centers
No. 24 gauge for spans up to 4′10″ centers
No. 22 gauge for spans up to 5′10″ centers
No. 20 gauge for spans up to 6′ 8″ centers

Evidence in the Chemical Industry—Many of the country's largest chemical manufacturers have found

WEIGHT OF ROBERTSON PROCESS METAL IN POUNDS PER 100 SQUARE FEET OF MATERIAL AREA

Gauge	Corrugated or Mansard				Flat			
	Net Weight		For Crated Shipments Add		Net Weight		For Crated Shipments Add	
	Black	Maroon	Domestic	Export	Black	Maroon	Domestic	Export
26	138	144	14	20	128	134	10	16
24	165	171	15	21	154	160	11	17
22	192	198	16	22	179	185	12	18
20	218	224	17	24	204	210	13	21

WEIGHT IN POUNDS PER LINEAL FOOT OF ROBERTSON PROCESS METAL FLASHING

Gauge	Girth in Inches						
	6″	7½″	10″	12″	15″	24″	30″
26	.7	.88	1.16	1.4	1.75	2.8	3.5
24	.8	1	1.33	1.6	2.00	3.2	4.0
22	1.0	1.25	1.67	2.0	2.50	4.0	5.0
20	1.2	1.50	2.00	2.4	3.00	4.8	6.0

Note All weights subject to variations

Spacing of Purlins	LENGTH OF PURLINS OR DISTANCE BETWEEN TRUSSES											
	12′		14′		16′		18′		20′		22′	
	⊏	I	⊏	I	⊏	I	⊏	I	⊏	I	⊏	I
3′ 10″	4″-5¼ lb	4″-7½ lb	5″-6¼ lb	4″- 7½ lb	6″- 8 lb	5″- 9¾ lb	7″- 9¾ lb	5″- 9¾ lb	7″- 9¾ lb	6″-12¼ lb	8″ 11¼ lb	6″ 12¼ lb
4′ 4″	5″-6½ ″	4″-7½ ″	6″ 8 ″	5″- 9¾ ″	6″- 8 ″	5″- 9¾ ″	7″- 9¾ ″	6″ 12¼ ″	8″-11¼ ″	6″-12¼ ″	8″-11¼ ″	7″ 15 ″
4′ 10″	5″-6½ ″	4″-7½ ″	6″-8 ″	5″- 9¾ ″	7″- 9¾ ″	5″ 9¾ ″	7″ 9¾ ″	6″ 12¼ ″	8″-11¼ ″	6″ 12¼ ″	9″ 13¼ ″	7″ 15 ″
5′ 4″	5″ 6½ ″	4″ 7½ ″	6″-8 ″	5″- 9¾ ″	7″- 9¾ ″	6″-12¼ ″	8″ 11¼ ″	6″ 12¼ ″	8″-11¼ ″	7″ 15 ″	9″ 13¼ ″	7″ 15 ″
5′ 10″	5″-6½ ″	4″-7½ ″	6″-8 ″	5″- 9¾ ″	7″ 9¾ ″	6″ 12¼ ″	8″ 11¼ ″	6″-12¼ ″	9″ 13¼ ″	7″ 15 ″	10″ 15 ″	8″ 17½ ″
6′ 4″	6″-8 ″	5″-9¾ ″	7″-9¾ ″	5″- 9¾ ″	7″- 9¾ ″	6″-12¼ ″	8″ 11¼ ″	7″-15 ″	9″-13¼ ″	7″ 15 ″	10″-15 ″	8″-17½ ″
6′ 10″	6″-8 ″	5″-9¾ ″	7″ 9¾ ″	6″ 12¼ ″	8″-11¼ ″	6″-12¼ ″	9″ 13¼ ″	7″-15 ″	9″ 13¼ ″	7″ 15 ″	10″-15 ″	8″-17½ ″
7′ 4″	6″-8 ″	5″-9¾ ″	7″-9¾ ″	6″ 12¼ ″	8″-11¼ ″	6″-12¼ ″	9″ 13¼ ″	7″-15 ″	10″ 15 ″	8″-17½ ″	12″-20½″	8″-17½ ″
7′ 10″	6″-8 ″	5″-9¾ ″	7″-9¾ ″	6″-12¼ ″	8″-11¼ ″	7″ 15 ″	9″ 13¼ ″	7″-15 ″	10″ 15 ″	8″-17½ ″	12″ 20½″	8″-17½ ″

Maximum unit bending stress, 16,000 pounds per square inch
Dead load equals weight of Robertson Process Metal corrugated roofing and purlins, from 3½ to 6 pounds per square foot.
Live load equals 40 pounds per square foot on horizontal surface
Pitch of roof, 6 inches per foot
If purlins are trussed, lighter sections may be used.

Continued on Next Page

ROSEDALE FOUNDRY & MACHINE CO.

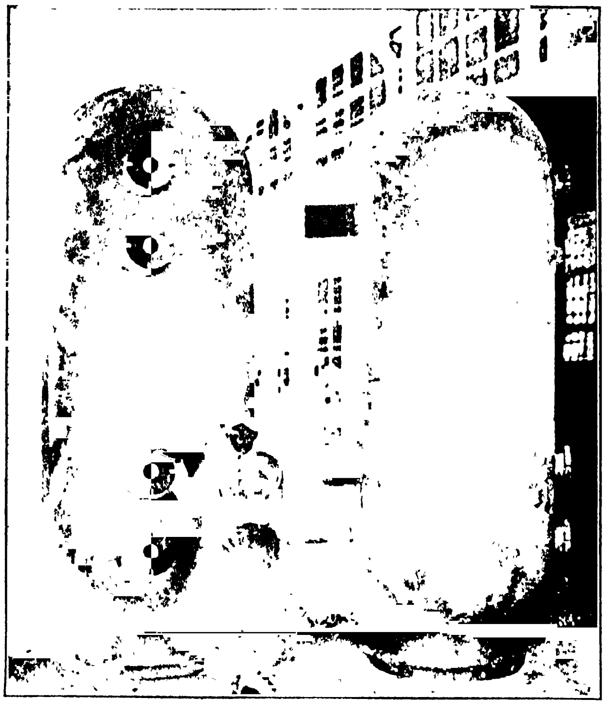
ESTABLISHED 1871

Engineers, Founders and Machinists

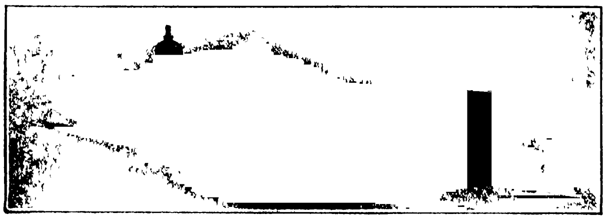
PITTSBURGH, PA.

PRODUCTS

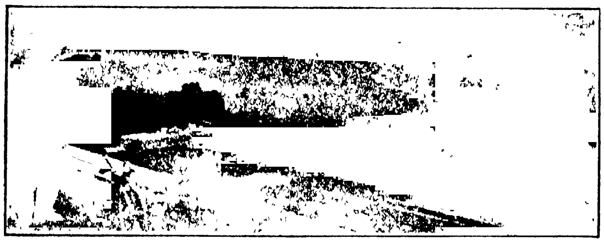
- Smelting Kettles
- Acid Eggs
- Ingot and Anode Moulds
- Machinery for the manufacture of plate, ribbed, wire and engraved glass.
- Special heavy machinery
- Chain Grate Stokers



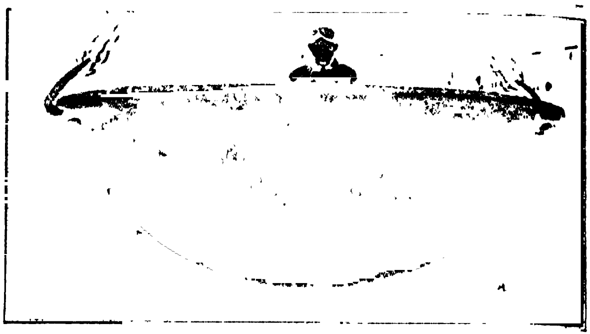
ACID EGGS
12' Long, 4' Inside Diameter, Weight 12000 Lbs., each



GLASS CASTING MACHINE
For rolling engraved, ribbed or figured glass

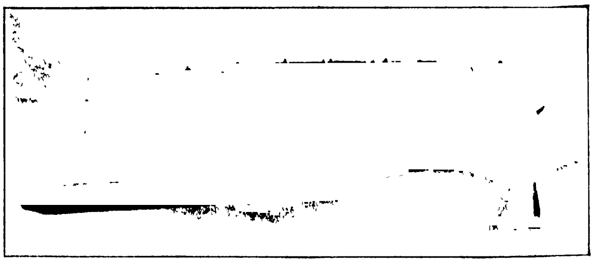


CORRUGATED WATER COOLED GLASS ROLL
30" Diameter x 16' 10" Long, Weight 25000 lbs.



SMELTING KETTLE
8' 10" Inside Diameter, Depth 42", Weight 12750 lbs

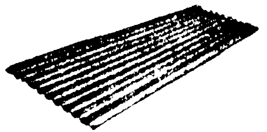
SPOUT KETTLE
4' 6" Inside Diameter, Depth 22¼"



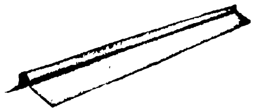
EXHAUST ELBOW
For 5000 k.w. steam turbine. Length 20' 4", Width 14' 7", Height 5' 9", Weight 48000 lbs

6600 K.W. SURFACE CONDENSER
Weight 72500 lbs.

tency toward condensation of moisture. Buildings in which it is used are drier, and easier to heat in winter, and remain cooler and more comfortable in summer. It is also proof against galvanic action. Its light weight, ease of erection, strength and permanency make construction as a whole less costly by comparison with other permanent building materials. Furthermore, first cost is the total cost.


ROBERTSON PROCESS METAL CORRUGATED SHEET

ROBERTSON PROCESS METAL MANSARD SHEET


ROBERTSON PROCESS METAL RIDGE CAP

For Replacement—The fact that old roofs and siding of ordinary corrugated metal need replacing in so short a time proves the need for a better material. It shows how unprofitable the unprotected metal has been. How its maintenance, painting and its upkeep costs have piled up and how in the long run it has been an expensive investment.

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	Net Weight		For Crated Shipments Add		Net Weight		For Crated Shipments Add	
	Black	Maroon	Domestic	Export	Black	Maroon	Domestic	Export
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Note All weights subject to variations

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	12′		14′		16′		18′		20′		22′	
	C	I	C	I	C	I	C	I	C	I	C	I
4′ 0″	4″-5¼ lb	4″-7½ lb	5″-6¼ lb	4″- 7½ lb	6″- 8 lb	5″- 9¾ lb	7″- 9¾ lb	5″- 9¾ lb	7″- 9¾ lb	6″-12¼ lb	8″ 11¼ lb	6″ 12¼ lb
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4′ 10″	5″-6½ "	4″-7½ "	6″-8 "	5″- 9¾ "	7″- 9¾ "	5″ 9¾ "	7″ 9¾ "	6″ 12¼ "	8″-11¼ "	6″ 12¼ "	9″ 13¼ "	7″ 15 "
5′ 4″	5″ 6½ "	4″ 7½ "	6″-8 "	5″- 9¾ "	7″- 9¾ "	6″-12¼ "	8″ 11¼ "	6″ 12¼ "	8″-11¼ "	7″ 15 "	9″ 13¼ "	7″ 15 "
5′ 10″	5″-6½ "	4″-7½ "	6″-8 "	5″- 9¾ "	7″ 9¾ "	6″ 12¼ "	8″ 11¼ "	6″-12¼ "	9″ 13¼ "	7″ 15 "	10″ 15 "	8″ 17½ "
6′ 4″	6″-8 "	5″-9¾ "	7″-9¾ "	5″- 9¾ "	7″- 9¾ "	6″-12¼ "	8″ 11¼ "	7″-15 "	9″-13¼ "	7″ 15 "	10″-15 "	8″-17½ "
6′ 10″	6″-8 "	5″-9¾ "	7″ 9¾ "	6″ 12¼ "	8″-11¼ "	6″-12¼ "	9″ 13¼ "	7″-15 "	9″ 13¼ "	7″ 15 "	10″-15 "	8″-17½ "
7′ 4″	6″-8 "	5″-9¾ "	7″-9¾ "	6″ 12¼ "	8″-11¼ "	6″-12¼ "	9″ 13¼ "	7″-15 "	10″ 15 "	8″-17½ "	12″-20½″	8″-17½ "
7′ 10″	6″-8 "	5″-9¾ "	7″-9¾ "	6″-12¼ "	8″-11¼ "	7″ 15 "	9″ 13¼ "	7″-15 "	10″ 15 "	8″-17½ "	12″ 20½″	8″-17½ "

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Continued on Next Page

ROVEY INSTRUMENT AND CHEMICAL CO., INC.
Exporters, Importers, Dealers Laboratory Apparatus and Chemicals
73-75 NIAGARA SQUARE, BUFFALO, N. Y.

PRODUCTS

Apparatus, Glassware, Reagents and Stains for Industrial and Educational Laboratories.

CHEMICAL·GLASSWARE

PYREX

A practical, efficient and economical glass for laboratories of industrial plants, schools and colleges where apparatus is frequently subjected to rough usage, and where expenses must be kept low.

PORCELAINWARE

COORS
U·S·A·

A Chemical and Scientific Porcelain equal, if not superior, to the best imported ware.

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WHATMAN
High Grade FILTER PAPERS

Embodies all the experience and accomplishment of 150 years of paper making mastery.

CHEMICALS

"BAKER'S ANALYZED" CHEMICALS

A complete line of chemical reagents, stains, normal and other solutions, oils and commercial chemicals.

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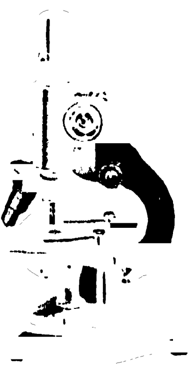
Our glass blowing factories, the best equipped in the country, are producing the highest grade glass apparatus and calibrated instruments. Special designs made according to drawings and specifications.

BACTERIOLOGICAL APPARATUS

Autoclaves, Centrifuges, Incubators, Sterilizers, Blood Counting Chambers, Dissecting Instruments, Microscopes, Microtomes and Accessories, Petri and Staining Dishes.



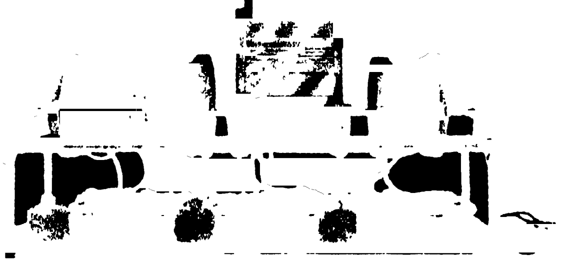
SPENCER MICROSCOPE NO. 44-H

LITERATURE

Descriptive pamphlets, bulletins and catalogs sent upon request.

INQUIRIES

We solicit your inquiries, drawings or specifications of materials, on which we will be pleased to submit quotations.



ORGANIC COMBUSTION FURNACE

JOHN ROYLE & SONS

PATERSON, N. J.

PRODUCTS

Rubber- **and Celluloid-Working Machinery: Tubing and Insulating Machines; Straining Machines; Circular Looms for Hose Manufacturers.**

Textile **Machinery (Jacquard-Card Cutting): Piano Machines, Lacers and Repeaters for hand or power operation.**

Photo-Engraver's and Electrotyper's Machinery: Routers; **Saw-tables; Bevelers; Planers; Mounting** and Squaring **Machines; Etc.**

TUBING MACHINES

Royle Tubing Machines are manufactured in six different sizes; their cylinder bores ranging from 1⅛ to 6" in diameter. Distinctive features include the powerful marine-type thrust bearing; four-point die and core adjustment; positive-circulation type of water jacket, and flexible system of head features which make the same machine suitable for a great variety of work

Most sizes can be furnished complete with motor drive, soapstoning equipment, water-cooled stock screw, and variable-speed take-off mechanism, accurately mounted together upon a substantial one-piece iron base.

STRAINING MACHINE

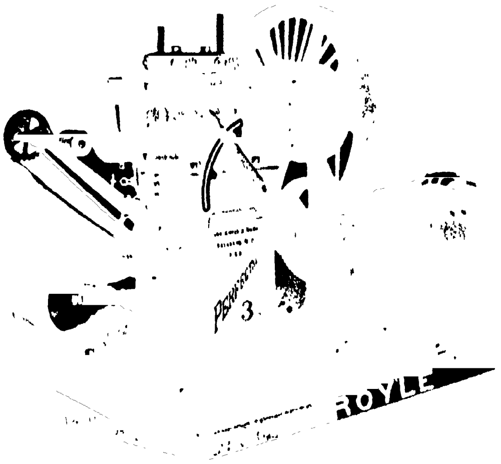
This unification of the machine with its accessories insures perfect meshing of gears and smooth economical operation. Catalog 213

CIRCULAR LOOMS

Royle circular looms are used for weaving the fabric jackets of fire, steam, garden, air, and other styles of hose. A perfect and uniform weave can be secured of whatever tightness is required. Ingenious and patented features assure uniform tension in both warp and filling.

The output is of continuous length, and may be woven around an interior core, the latter being fed upward through the hollow central column of the loom Weaves either right-hand or left-hand with slight change of fixtures.

Linear capacity as high as 1000 ft. of hose jacket per day Diameters up to 8 in Booklet 295

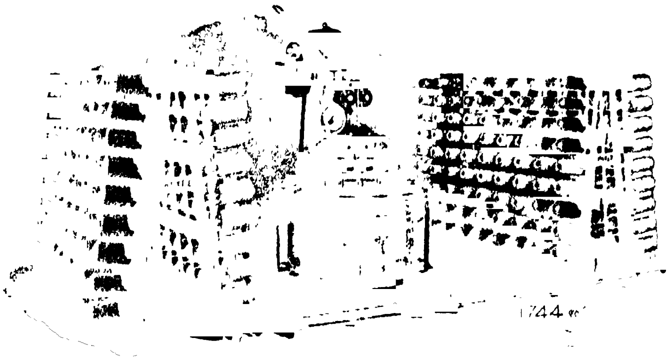


TUBING MACHINE

STRAINING MACHINES

Where a great deal of compound must be strained quickly, we recommend the use of our special three-way delivery straining machine. Although built on the tubing machine principle, the stock-worm and cylinder are especially designed to handle large quantities of material so that full advantage may be taken of the large straining area provided by the three-way delivery head.

Under suitable conditions this style of machine will deliver more than three times as much clean stock as a single-delivery straining machine of equal bore. No heavy parts to handle in cleaning. Booklet 281.



CIRCULAR LOOM

RUMSEY PUMP COMPANY LIMITED

129 Johnston Street
SENECA FALLS, N. Y.

75 WARREN ST., NEW YORK, N. Y.
49 FEDERAL ST., BOSTON, MASS.

PRODUCTS: A complete line of hand pumps and power pumping machinery, for industrial service.

FIG. 681
STANDARD TYPE TRIPLEX PUMP BUILT IN CAPACITIES UP TO 90 G. P. M.

RUMSEY TRIPLEX PUMPS

A line of simple, compact power pumps, offered in a wide range of styles and sizes for any pumping application: For water supply and fire protection, boiler feeding, circulating, exerting pressures, pumping special liquors, chemicals, etc.

These machines are planned in every detail of design and construction for durable, practical service and their unusual merit is proven daily in thousands of mills and industrial plants throughout the country.

Construction details necessarily vary greatly according to the service for which pumps are rated and special conditions under which they are to operate. Detailed specifications of any pump will be mailed on request.

All pumps are regularly fitted for handling cold water but are equipped for hot water service without extra charge. Brass or bronze mountings, special valves and packing or other alterations from standard construction necessary to meet the requirements of the Chemical field are made at a slight margin over cost.

Any pump can be furnished with special equipment, by-passes or the like, or arranged on bed plate or foundation for gear, belt, chain or direct connection to driving power.

FIG. 696
ELECTRIC MOTOR DRIVEN TRIPLEX PUMP FOR HYDRAULIC PRESSURE

STANDARD SIZES AND CAPACITIES, MODERATE PRESSURE, SINGLE ACTING TRIPLEX PLUNGER PUMPS

Capacity per minute at moderate speed, gals	Working pressure, lbs	Figure No	Plungers diameter x stroke ins	Displacement per rev gals	Pipes		Standard pulleys ins	Cipher
					Suc ins	Dis ins		
1.5	150	681	1¼x 2	0.03	1	¾	12x 1½	Cabbage
1.5	200	684	1¼x 2	0.03	1	¾	12x 1½	Conclave
3.5	200	684	1½x 3	0.07	1	1	12x 2	Conclude
4.5	150	681	1¾x 3	0.09	1	1	12x 2	Cab
6	130	681	2 x 3	0.12	1¼	1¼	12x 2	Cabajal
8	200	684	2 x 4	0.16	1¼	1¼	12x 2½	Concoct
10	150	681	2¼x 4	0.20	1¼	1¼	12x 2½	Cabal
13	150	681	2½x 4	0.25	1¼	1¼	12x 2½	Cabaret
14	200	684	2½x 4½	0.28	1½	1½	15x 2½	Concord
20	150	681	3 x 4½	0.41	1½	1½	15x 2½	Cabin
25	150	681	3 5/16x 4½	0.50	1½	1½	15x 2½	Cablet
25	200	684	3 x 5	0.46	1½	1½	20x 3	Concor
30	150	681	3½x 5	0.62	2	2	20x 3	Cabob
35	200	684	3½x 6	0.75	2	2	20x 4	Concuss
50	150	681	4 x 6	1.00	2½	2	20x 4	Caboose
60	120	681	4½x 6	1.24	3	2½	20x 4	Cabooson
75	150	681	5 x 6	1.53	3	3	24x 5	Cabotage
90	120	681	5¼x 6	1.85	3	3	24x 5	Caburn
100	85	692	5 x 8	2.00	3½	3	24x 4	Coping
100	150	691	5 x 8	2.00	3½	3	30x 5	Communion
100	200	698	5 x 8	2.00	3½	3	30x 6	Coterie
125	65	692	5½x 8	2.46	3½	3	24x 4	Copse
125	125	691	5½x 8	2.46	3½	3	30x 5	Comet
125	165	698	5½x 8	2.46	3½	3	30x 6	Cotgare
150	55	692	6 x 8	2.93	4	3½	24x 4	Coquette
150	100	691	6 x 8	2.93	4	3½	30x 5	Commuter
150	140	698	6 x 8	2.93	4	3½	30x 6	Cotia
175	43	692	6½x 8	3.44	4	4	24x 4	Coquina
175	85	691	6½x 8	3.44	4	4	30x 5	Comose
175	120	698	6½x 8	3.44	4	4	30x 6	Cotoin
215	85	692	6½x10	4.30	5	4	30x 6	Cordovan
215	150	691	6½x10	4.30	5	4	36x 6	Compact
215	200	698	6½x10	4.30	5	4	42x 6	Cotswold
250	195	690	7 x10	5.00	5	5	42x 6	Comprint
270	75	692	7¼x10	5.35	6	5	30x 6	Cormorant
270	125	691	7¼x10	5.35	6	5	36x 6	Combing
270	160	698	7¼x10	5.35	6	5	42x 6	Cotta
325	55	692	8 x10	6.50	6	5	30x 6	Coronet
325	100	691	8 x10	6.50	6	5	36x 6	Combative
325	130	698	8 x10	6.50	6	5	42x 6	Cottage
345	150	690	8¼x10	6.94	6	5	42x 6	Compart
415	125	690	9 x10	8.26	7	6	44x 6	Compass
415	150	690	9 x10	8.26	7	6	42x10*	Compeer
445	185	690	9 x12	9.91	8	8	48x10*	Compile
510	100	690	10 x10	10.20	8	8	44x 6	Complex
510	150	690	10 x10	10.20	8	8	42x10*	Compose
550	150	690	10 x12	12.24	8	8	48x10*	Compress
560	85	690	10½x10	11.25	8	8	44x 6	Compotal
560	135	690	10½x10	11.25	8	8	42x10*	Compotete
570	215	788	10 x14	14.28	8	8	60x14†	Corrigent
605	135	690	10½x12	13.50	8	8	48x10*	Compret
690	90	789	11 x14	17.28	12	10	60x10*	Corposee
690	175	788	11 x14	17.28	12	10	60x14†	Corrifon
820	75	789	12 x14	20.56	12	10	60x10*	Corposant
820	150	788	12 x14	20.56	12	10	60x14†	Corra
965	65	789	13 x14	24.12	12	10	60x10*	Corpulent
965	130	788	13 x14	24.12	12	10	60x14†	Correlate
1,120	55	789	14 x14	27.98	12	10	60x10*	Corpuscle
1,120	110	788	14 x14	27.98	12	10	60x14†	Corridor

*Single pulley. †Single pulley for double belt. Other sizes have tight and loose pulleys

FIG. 692
STANDARD TYPE TRIPLEX PUMP FOR LIGHT SERVICE

FIG. 698
STANDARD TYPE TRIPLEX PUMP FOR HEAVY DUTY

FIG. 695
TYPICAL DESIGN OF HYDRAULIC PRESSURE PUMP SHOWING A PUMP FOR 8000 LBS. PRESSURE

FIG. 694
BALL VALVE TYPE TRIPLEX PUMP FOR VISCOUS LIQUIDS

Continued on Next Page

RUMSEY ROTARY PUMPS

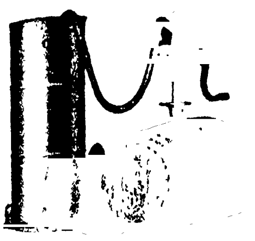


FIG. 196½
ROTARY TRANSFER PUMP

Rotaries are used with economy by thousands of manufacturers for water supply or for handling a great variety of liquids such as oils, varnishes, acids and chemicals, molasses, glue, extracts, ink, chocolate, milk and the like As the action of these pumps is metal to metal they cannot be used for gritty liquids

Fig 196½ Hand Rotary Pump is designed for emptying barrels or transferring liquids from one container to another Hand pumps are also made with bases for floor or shelf mounting Connections may be for either pipes or hose

FIG. 197½
POWER ROTARY PUMP

Fig 197½ Power Rotary Pump is used for water supply and for pumping oils and chemicals

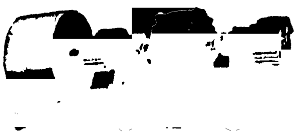


FIG. 198
POWER ROTARY PUMP

The heavier type of Power Rotary Pump, Fig 198, is extensively used in mills, warehouses and factories for general water supply, pumping to sprinkler systems, handling special liquids and for fire protection

No	Capacity per min 100 Rev *	Pipe Suc. in	Pipe Dis in	Pulleys Diam x Face	List Iron	List Bronze Case and Cams	List Bronze
				FIG. 196½			
1	13 gals		1†		$19.00		$63 00
2	25 "		1†		22.00		71.00
				FIG. 197½			
1	13 gals	1¼	1¼	7 x 2½	$26 50	$75.00	$90 00
2	25 "	1½	1½	7 x 2½	30.00	83.00	98 00
4	29 "	2	2	12 x 3¼	47.50	125.00	159.00
5	43 "	2½	2	15 x 3¼	53 00	142.00	189.00
				FIG. 198			
1	29 gals	2	2	14 x 4½	$175.00	$267.00	$315.00
2	43 "	2½	2½	16 x 5½	200.00	340.00	385 00
3	87 "	3	3	18 x 6½	280.00	500.00	585.00
4	168 "	4	5	20 x 8½	415.00	875 00	1055.00
5	270 "	6	6	24 x 8	530.00	1175 00	1450.00
6	456 "	8	8	28 x 9	835.00	1840 00	2300.00

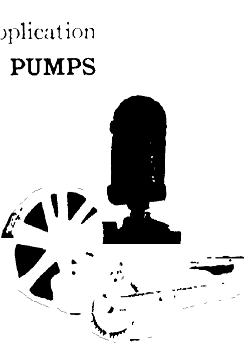
*For light or intermittent service, speed may be increased; for heavy, constant duty, speed should be diminished.
†For hose

The moderate price of the rotary pump as compared with its large capacity has made it a very popular type for such service.

BULLETIN DC—18 on application

DOUBLE ACTING POWER PUMPS

Reliable pumps for tank pumping and general use where an inexpensive outfit is desired Made with brass lined cylinder, leather packed piston, metal valves, large air chamber and back gearing These pumps are offered in capacities of from 4 to 65 gals per minute Illustration shows a 2 x 3-in. pump, larger sizes differ in design.



DOUBLE ACTING PUMP

RUMSEY CENTRIFUGAL PUMPS

A range of inexpensive centrifugal pumps to meet the requirements of industrial plants for water supply, drainage, circulating, handling thick liquids, pulps and chemicals and for many special applications, where the total head does not exceed fifty feet

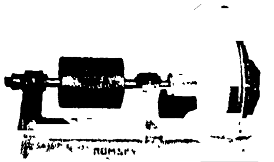


FIG. 201
HORIZONTAL PATTERN
BELT DRIVEN

These pumps are interchangeable throughout and peculiarly adapted to acid service on account of the case and low cost of renewals

FIG. 202
VERTICAL PATTERN SUBMERGED TYPE, BELT DRIVE

These pumps are built in both horizontal and vertical patterns either for belt or direct motor drive and with many possible variations in detail

Special centrifugal pumps for handling concentrate sulphuric acid or liquors of like action are also made, as are a number of more expensive pumps for heavier duty

FIG. 205
HORIZONTAL PATTERN
MOTOR DRIVEN

No	Pipe Sizes Suc	Pipe Sizes Dis	Normal Capacity per Min gallons	Pulley Diam x Face Inches	List Iron	List Brass
			FIG. 201 HORIZONTAL TYPE			
00	1	1	10	3 x 3	$ 28 00	$ 52 00
2	2	2	75	6 x 6	35 00	98 00
3	2½	2½	150	7 x 8	65 00	196 00
4	3	3	225	7 x 8	75 00	236 00
5	4	4	325	8 x 10	90 00	261 00
6	5	4	625	10 x 10	120 00	408 00
6½	6	5	925	10 x 10	140 00	530 00
7	7	6	1300	12 x 12	180 00	652 00
8	10	8	2400	18 x 12	310 00	
			FIG. 202 VERTICAL SUBMERGED TYPE			
2		2	75	6 x 6	$ 28 00	$ 85 00
3		2½	150	7 x 8	55 00	163 00
4		3	225	7 x 8	65 00	212 00
5		4	325	8 x 10	70 00	261 00
6		4	625	10 x 10	105 00	326 00
6½		5	925	10 x 10	130 00	497 00
7		6	1300	12 x 12	150 00	571 00
8		8	2400	18 x 12	265 00	

RUMSEY DIAPHRAGM PUMPS

Large capacity hand pumps for drainage or handling thick liquors or liquids containing foreign matter that would clog an ordinary pump Made in three sizes for 2½, 3 or 4 inch suction hose or pipe and with either side suction as illustrated or bottom suction for vertical pipe connection

FIG. 535
SIDE SUCTION

BULLETINS

General Catalog 57th Edition, Hand and Power Pumps: Catalog DC, Rotary Pumps, Catalog DF, Centrifugal Pumps; Catalog B, Triplex Power Pumps; Catalog DW, Deep Well Pumps; Brochures on special hand and power pumps

RUGGLES-COLES ENGINEERING COMPANY

Established 1893

Designers and Builders of Ruggles-Coles Dryers

120 BROADWAY, NEW YORK, N. Y.

PRODUCTS

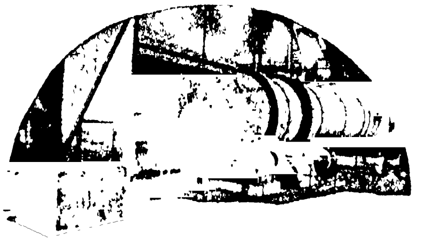
Ruggles-Coles Rotary and Paddle Dryers; double and single shell; eight standard types for drying by means of direct heat, indirect heat or steam.

CLASS "A" DRYER

This is a patented double shell, direct heat dryer especially adapted for materials which can be dried in large quantities; viz:

Coal	Rock
Coke	Sand
Ores	Stone
Clays	Concentrates, etc.

With this type of dryer, the maximum temperature to which the material can be heated is 400° F., though the machine may be so operated that the material will not be heated to over 220° F.



CLASS "A" DRYER

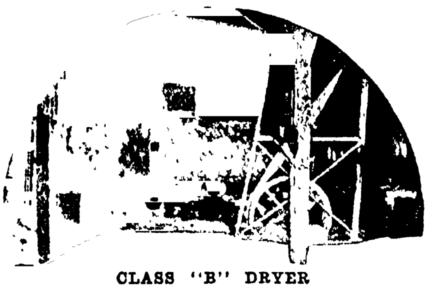
Our Class "A" Dryer is built in nine standard sizes.

CLASS "B" DRYER

Our Class "B" Dryer is a patented double shell, indirect heat dryer, especially designed for drying

China Clays	Whiting
Talc Rock	Kaolin

and those materials which may be dried at a fairly high temperature but must not come in contact with the products of combustion due to possible injury or contamination.



CLASS "B" DRYER

This dryer is made in three standard sizes.

CLASS "C" DRYER

A rotary steam dryer for materials which must be dried at a low temperature to prevent injury to the material, viz.

Brewer's Grains	Starch Feed
Cotton Seed	Tobacco Stems
Corn Germs, etc.	

CLASS "C" DRYER

Either live steam or exhaust steam may be used to greatest advantage with our Class "C" Dryer, which is made in four standard sizes.

CLASS "D" AND "E" DRYERS

These are paddle dryers, built in special sizes for direct heat, indirect heat or steam—depending upon the material to be dried.

CLASS "F" DRYER

This is a single shell, direct heat dryer of heavy and substantial design for use on those materials and in those places where first costs are the main consideration.

CLASS "F" DRYER

Our Class "F" Dryer is built in seven standard sizes.

GENERAL

For over a period of 28 years, the Ruggles-Coles Engineering Company have specialized in drying problems and drying equipment. Our dryers possess a high reputation for rugged construction; continuity of operation; low maintenance and operating costs; greatest capacity and thorough drying.

We suggest that inquiries regarding any of our eight types of dryers be accompanied by specific information concerning the material to be dried and conditions of operation. Full details will be gladly submitted.

SARCO COMPANY, INC.

Manufacturers of Steam Traps and Temperature Regulators

19 BARCLAY STREET, NEW YORK, N. Y.

Philadelphia, Pa., Drexel Bldg
Buffalo, N. Y., Ellicott Square

Cleveland, O., 6523 Euclid Ave
Detroit, Mich., Majestic Bldg

Chicago, Ill., Monadnock Blk
Montreal, Can., Peacock Bros

PRODUCTS

Steam Trap Sarco; Sarco Radiator Trap; Sarco Temperature Regulators for Liquids and Atmosphere.

STEAM TRAP SARCO

This is a small, compact, simple steam trap that does the same work as the more cumbersome bucket or float traps and costs only one-third the price.

The Steam Trap Sarco has only one moving part. No levers, gauges, stuffing boxes, etc., to get out of order and need attention.

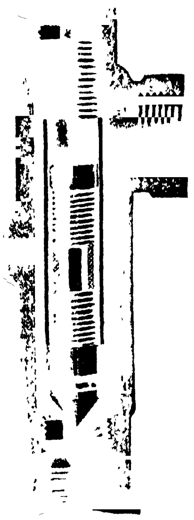
The Sarco operates automatically and dependably by the opening and closing of a valve controlled by a sensitive but absolutely reliable expansion element.

It releases condensate as rapidly as it collects, and does not waste live steam. Condensate is returned to the hot well while still hot, instead of lying around until it is cold as in bucket traps.

Can be installed any point on line, at any angle. No floor space, pit digging, building up or supports required.

Made in sizes ⅜ to 3 inches for any given pressure up to 200 lbs.

Sold on 30 days' free trial. Booklet K-12 on request.



DETAIL OF STEAM TRAP SARCO

LOW PRESSURE—0 TO 50 LBS.

Size	⅜″	½″	¾″	1″	1¼″	1½″	2″	2½″	3″
P	$6 00	$6 00	$9 45	$11.25	$21 15	$30 00	$38 70	$51 75	$60 00

HIGH PRESSURE—50 to 200 LBS.

Size	⅜″	½″	¾″	1″	1¼″	1½″	2″	2½″	3″
Pr	$7.75	$7 75	$10.85	$12 00	$28 50	$34.50	$48 30	$60 00	$75.00

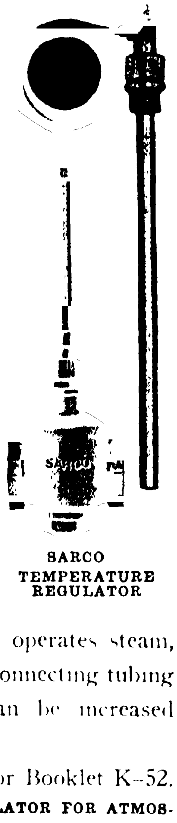
SARCO TEMPERATURE REGULATOR

Is made for room temperature control, for dry kiln work and for tank control, and is supplied for any given temperature between 30° and 300° F.

It derives actuating motive power from the expansion and contraction of a sensitive liquid hermetically sealed within the apparatus. In its simplest terms the regulator consists of a tube of oil, which, on expanding, operates a packless valve. Thus the regulator is entirely self-operated. It requires neither water, electricity, nor compressed air.

The first cost is moderate, installation expense trifling, and operation expense entirely eliminated. Has no complicated attachments to get out of order—no leather or rubber diaphragms or other perishable parts.

The Sarco Temperature Regulator is suitable for laboratory control as well as for all manufacturing processes within its range of temperature.



SARCO TEMPERATURE REGULATOR

The Sarco Temperature Regulator operates steam, water and gas valves, and has 6 feet connecting tubing between elements, which length can be increased where conditions necessitate.

Sold on 30 days' free trial. Ask for Booklet K-52.

TYPE KR-14 SARCO TEMPERATURE REGULATOR FOR ATMOSPHERE UP TO 300° F.

Size of valve	½″	¾″	1″	1¼″	1½″	2″	2½″	3″	4″	5″	6″
List prices ...	$60	$65	$70	$75	$85	$95	$110	$130	$170	$225	$265

TYPE TR-21 SARCO TEMPERATURE REGULATOR FOR LIQUIDS AND DRY KILNS

Size inches	Weight pounds	List prices	Size inches	Weight pounds	List prices	Size inches	Weight pounds	List prices
½	8	$75	1½	22	$95	3	51	$135
¾	8	80				4	81	185
1	9	85	2	28	100	5	132	250
1¼	13	90	2½	37	115	6	158	300

THE SCHAEFFER & BUDENBERG MFG. CO.

Instruments for

Measuring Pressure, Temperature, Power and Speed

BROOKLYN, N. Y.

Philadelphia Pittsburgh Chicago Los Angeles Washington San Francisco Detroit Atlanta

PRODUCTS AND SERVICES

Gauges: Pressure, Vacuum and Draft;

Recording Gauges: "Columbia" and "Schaeffer";

Indicating Thermometers: "Crescent" and "Reform"; Recording Thermometers: "Columbia" and "Schaeffer";

Tachometers: Hand and Stationary;

Counters: Indicating and Recording;

Calorimeters: "Carpenter's" Separating and Throttling Steam.

Also Gauge Testers, Gauge Glasses, Locomotive Clocks, Barometers, Calorimeters, Gauge Boards and Complete Equipment.

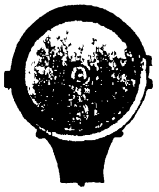
Without obligation, our Engineering Department will make recommendations, based on over 70 years' experience, for increasing production, lowering operating cost and eliminating spoilage of goods by the use of above instruments.

GAUGES

PRESSURE GAUGE

A complete line of S & B pressure, vacuum and draft gauges for all purposes. Have extra heavy, long-wearing, non-corrosive movement. Dial is hand calibrated, insuring accuracy. White enameled matt finish eliminates glare and makes reading easy. Write for Catalog No. A-3.

RECORDING GAUGES



"COLUMBIA" RECORDING GAUGE

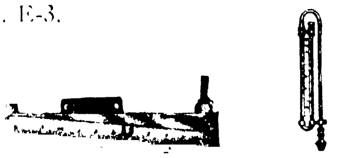
"Columbia" and "Schaeffer" Recording Gauges for accurately recording pressure, vacuum or draft.

Being non-corrosive and especially rugged in construction, the clock movement in these gauges will outwear any other make.

Time Punch makes a small hole in disc at exact time button is pressed, thus acting as a time clock.

Removable arm makes it easy to renew chart. No danger of straining arm and affecting accuracy of record. Pen is of glass and can be renewed. It cannot corrode nor leak. Day and night records are more easily read than on other makes due to wider area. Write for Catalog No. E-3.

DRAFT GAUGES



"Redline" Differential "U"

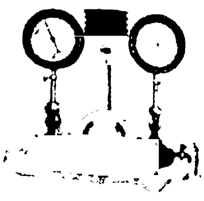
DRAFT GAUGES

S & B "Redline" Draft Gauges have closed front, protecting glass parts against breakage and eliminating exposed cavity where dust ordinarily collects.

Body is polished aluminum. Indicating column is thoroughly seasoned Jena glass with uniform bore. Scales are accurately calibrated. Spirit level is carefully fitted.

Made in many designs and types for measuring drafts. Write for Catalog No. C-3.

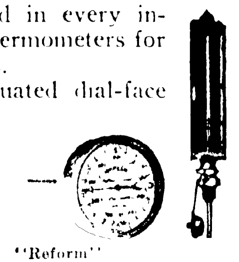
GAUGE TESTERS



GAUGE TESTER

Gauges must be accurate at all times and should, therefore, be periodically tested. Among the many types of S & B Gauge Testers for testing gauges of all types and capacity, there is sure to be an apparatus that is compatible with your needs. Write for catalog No. D-3.

THERMOMETERS



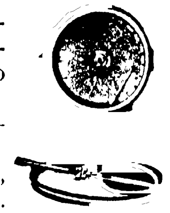
"Reform" Dial "Crescent"

THERMOMETERS

Among our line of high grade "Crescent" Thermometers will be found those used in every industry. Also other types of thermometers for diverse industrial requirements.

The "Reform" mercury-actuated dial-face thermometer is made with rigid back or bottom connection, or with flexible connection, for any temperature range up to 1000° F. Write for Catalogs F-3 and G-3.

RECORDING THERMOMETERS



"COLUMBIA" RECORDING THERMOMETER

"Columbia" and "Schaeffer" Recording Thermometers give authentic records of temperature up to 1000° F.

Three types, actuated by either mercury, gas or vapor tension.

Clock movement is ruggedly built, for long service. Will not corrode.

Responds instantly to slightest temperature changes and guaranteed accurate.

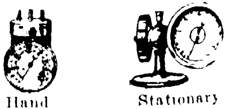
Time Punch makes a small hole in disc at exact time button is pressed, thus acting as a time clock.

Removable arm makes renewal of chart easy and eliminates possibility of straining arm and affecting accuracy of records.

Renewable glass non-spilling and non-corroding pen insures dependable, readable records. Day and night chart has wider area than usual, giving a more readable record.

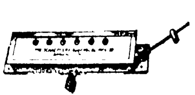
Tubing is fume, acid and water proof and practically indestructible. Write for Catalog No. H-3.

TACHOMETERS



Hand Type Stationary Type

TACHOMETERS



SQUARE CASE COUNTER

For measuring speeds of shaftings, machines, motors, turbines, etc., directly in r. p. m. S & B Tachometers are made in several types, both hand and stationary. The latter are for permanent connection, of both indicating and recording types, for all applications. Write for Catalogs Nos. J-3 and K-3.

THE SCHAFFER ENGINEERING & EQUIPMENT CO.

Peoples Bank Building, PITTSBURGH, PA.
Cable Address: SEECO, PITTSBURGH

PRODUCTS:

The **Schaffer Hydrator; The Schaffer Poidometer; Shaking Screens; Calcining Processes; Etc.**

Specialists in Automatic Operation of Heavy Duty Plants.

THE SCHAFFER HYDRATOR:

Will operate *automatically*.

Will give laboratory conditions in practical operations.

Will handle dolomitic or high calcium quicklimes.

Will hydrate any materials capable of hydration.

Will consume little power per ton capacity.

Will occupy little space per ton capacity.

Will be cheaper to install per ton capacity.

Will permit of absolute control to suit any conditions.

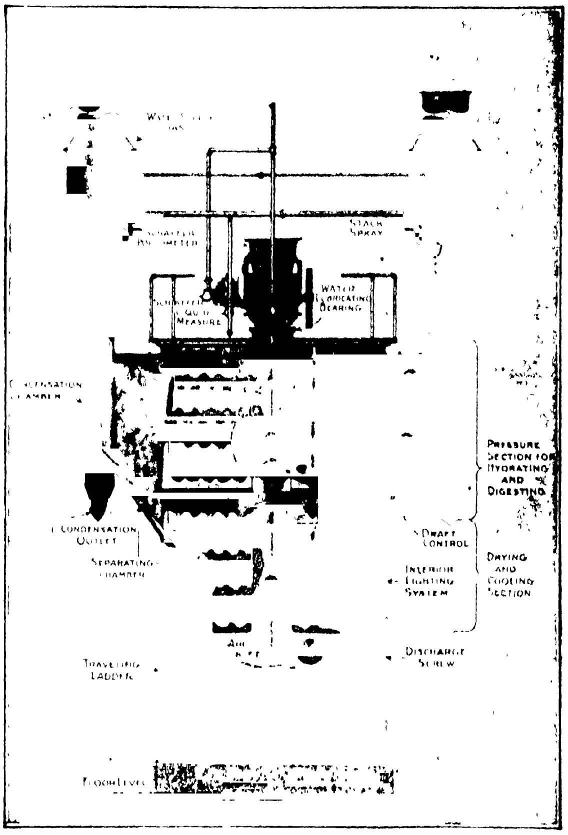
Will give a product superior to any competing machine or process.

Will operate mechanically right.

Will require minimum repairs.

Will prove indispensable after investigation.

Write for literature.

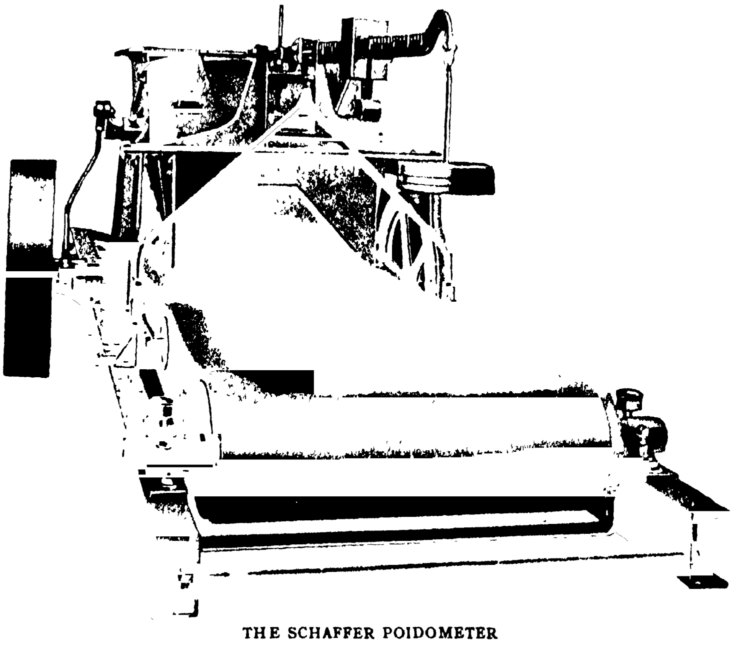


THE SCHAFFER HYDRATOR

THE SCHAFFER POIDOMETER:

The Schaffer Poidometer is essentially a weighing machine and is positively indispensable where materials are to be correctly apportioned. It is accurate up to 99.75%. It is very economical in operation and is the only commercial scale on the market today which will perform the function of correct proportioning of materials and of adding liquids thereto with the accuracy above mentioned. Mechanical weighmaster attachment permits of batch use where desired, although it is primarily a continuous *automatic* weighing machine.

Write for our Bulletin No. 5 fully describing this machine and let us tell you what it will do in your particular instance. Every machine installed on a guarantee of absolute satisfaction.



THE SCHAFFER POIDOMETER

SCHUTTE & KOERTING COMPANY

Manufacturing Engineers

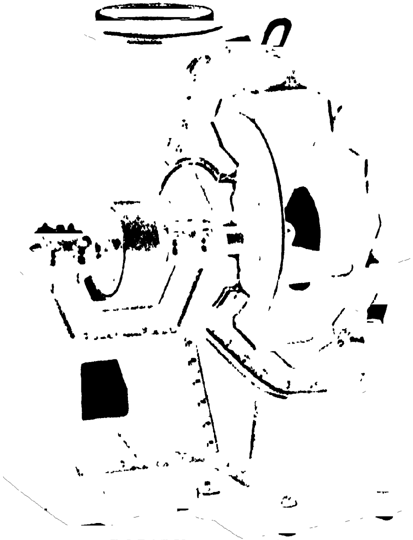
MAIN OFFICE AND WORKS

12TH AND THOMPSON STS., PHILADELPHIA, PA.

PRODUCTS

Equipment for lifting liquids, moving air and other gases, burning oil, heating and cooling oil, also Condensers, Spray Nozzles, Liquid Heaters, Acid Valves, Injectors, Engine and Boiler Valves, Etc.

LEAD FANS



ROTARY LEAD FAN

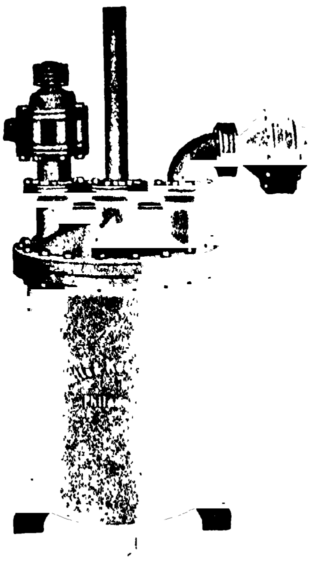
For Chemical Works, features that remove nearly all overhang on the shaft, prevent leakage around the shaft and give positive suction and discharge.

We have fans for all capacities Made of regulus metal and of improved design, low horse power, low speed with large capacity; built for any position discharge.

BIHN JONES AUTOMATIC BLOW CASES

The only truly Automatic Acid Egg; operated by compressed air and so nicely controlled by the Automatic valve that it entirely eliminates air loss and expense of labor for operating.

Particularly adapted to continuous circulating conditions, high lifts and corrosive liquids.



AUTOMATIC BLOW CASE

It permits the use of a small egg and maintains a steady level in receiving tanks and in sulphuric acid chamber sets it will assist in increased production and reduce nitre consumption as well as labor and air expense.

The Essential Valves can be installed on existing blow cases.

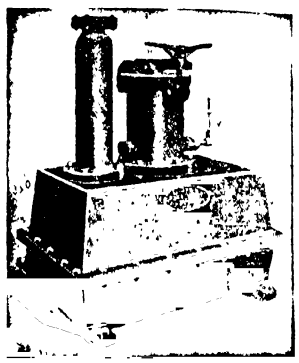
There is only one movable part, hence it gives long and efficient service.

HARD LEAD CENTRIFUGAL PUMPS

The Body as well as the rotor of these pumps is made of lead with a steel shaft which is protected from the acid by a lead sleeve.

These lead pumps are designed for hard, continuous service. Furnished with or for any type of drive desired, and of different chemical resistant material.

SULPHUR FURNACES



SULPHUR FURNACE

The features of this furnace are its closed type, heavy construction, freedom from sublimation and long and efficient service.

Especially applicable to bleaching sulphating and sulphurous acid operations.

HEAT TRANSFER EQUIPMENT

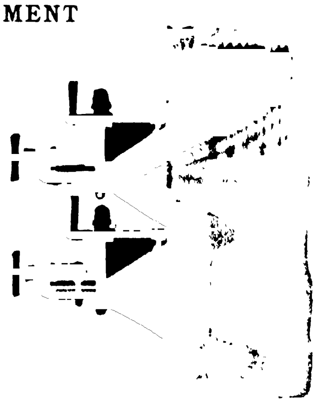
Our Oil Coolers find a wide application in process work and industrial requirements.

OBNOXIOUS VAPOR CONDENSERS

For the elimination of objectionable fumes and odors in Fertilizer Works, Acid Plants, Glue Works, Etc.

It produces its own suction, hence, combines the action of a fan or blower with the absorbent action of a water jet or spray. No movable parts, inexpensive in operation. In special cases other liquids than water may be used.

OIL BURNING EQUIPMENT



MECHANICAL FORCED DRAFT BURNER

We manufacture Oil Burning Equipment that is adapted to every industrial need. Our line includes Mechanical Atomizers, Steam and Air Atomizers.

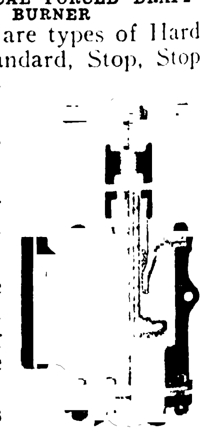
We have a Burner for every class of liquid and gaseous fuel.

Our Oil Heaters and Strainers are universally used in industrial plants.

VALVES

We manufacture a complete line of Boiler and Engine Valves, among which are types of Hard Bronze, Schutte Extra Heavy Standard, Stop, Stop Check, Check, Emergency, Balanced Throttle, Trip and Throttle, Reducing, Engine Stop Systems, and many others.

LEAD LINED VALVES



LEAD LINED VALVE

Globe and Angle—All surfaces of this valve liable to be affected by acid are substantially lined with lead, and all faces are turned true so as to obtain a perfect joint which effectively prevents acid leaking through and disintegrating the metal parts.

The construction of this valve is clearly shown in the illustration.

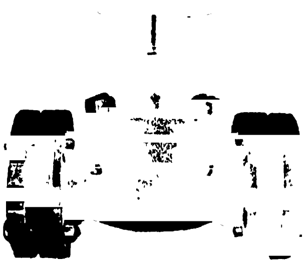
Continued on Next Page

hand-wheel and nut only revolve; the spindle turn—its movement is up and down only, and therefor indicates the open and closed position valve disc consists of a broad plate which con- with its seat practically as a line, hence will not dirt or stick as is so apt to occur in a conical or seat type of valve.

lead lined with a protecting iron shell it is and light in weight, but strong and applicable conditions of operation suitable to lead valves.

DIAPHRAGM ACID VALVES

Objectionable features have been overcome in the diaphragm valves shown herewith. They have no stuffing box and no stem extending into the acid. The disc is made of high-grade rubber composition which withstands the action of acid, and has no tendency to stick on the seat. The acid comes in contact only with lead or rubber. The valve body is hard lead throughout and is a durable valve applicable to cool and moderately strong acids.


LEAD DIAPHRAGM VALVE

JET APPARATUS

This embraces a large number of types of equipment, in which steam, water or air is used as the motive power. The conditions of operation decide the nature of the apparatus and the motive power most suitable.

We supply equipment for transferring liquids, moving gases to give vacuum or compression, induce drafts and produce ventilation, prime pumps, assist in processes of distillation or evaporation, etc.

The list embraces Boiler Feed Injectors, Syphons, Noiseless Heaters, Exhausters, Blowers, Air Jet Lifts, Condensers, etc.

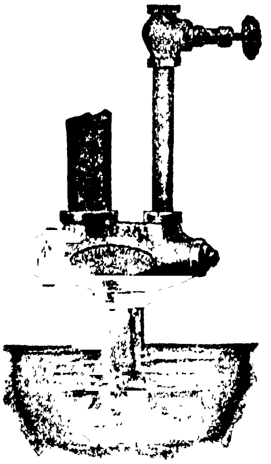
KOERTING SYPHONS

They are especially suitable for transferring liquids from tank to tank, for circulating, agitating, and making or assisting in solution of solids.

They are made of brass, iron, lead, stoneware or hard rubber and can be supplied to operate with water instead of steam, if desired.

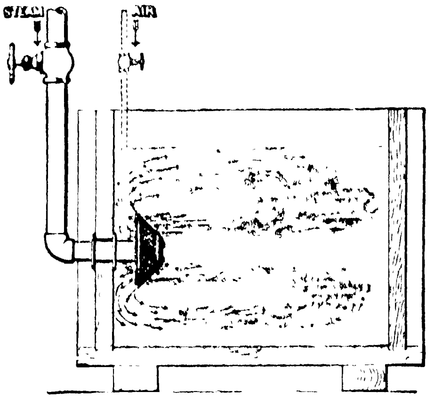
AIR JET LIFTS

When air is desired as a motive power the Air Jet Lift is a simple and efficient apparatus for lifting liquids. Continuous operation, low pressure of air, no moving parts, and great durability in service.


"UNIVERSAL" SYPHON INSTALLATION

NOISELESS HEATERS

In the many cases where liquids are heated by direct admission of steam this heater finds application because it not only eliminates the heavy knocking noise, but at the same time heats more quickly by its circulating and agitating action. We have modified forms to meet different conditions.


INSTALLATION OF A NOISELESS HEATER

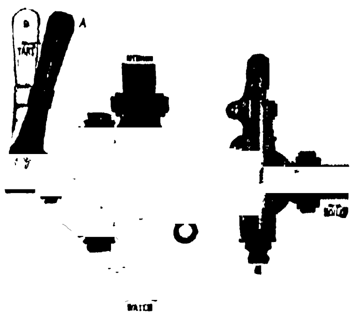
INJECTORS

The term "Koerting Universal Double Tube Injector" is synonymous with the highest requirements in Industrial Boiler Practise.

These Injectors handle water at temperatures up to 150 deg. F., and are absolutely reliable in operation.

EXHAUSTERS

These are made of suitable material and are applied to the production of vacuum or compression, handling of gases, agitating liquids, priming pumps, etc.


"UNIVERSAL" DOUBLE TUBE INJECTOR

SPRAY NOZZLES

Rubber, Brass, Stoneware, Iron, Lead, Witclay, Steel, Glass, Special.

They are applicable to all chemical purposes such as acid manufacture, absorption of gases, washing of gases or solids, solution, removal of objectionable gases or vapor, cooling by sprays, or in fact any conditions where liquids as a spray can be utilized.

MULTI JET CONDENSERS

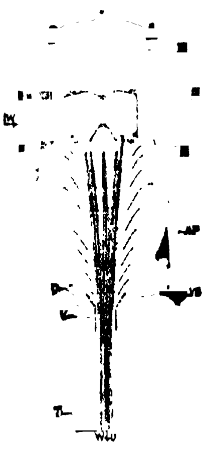
Invite your attention by the following features:

Compactness and low head-room requirements.

Absence of a separate air pump, the removal of the non-condensable gases being accomplished by means of water jets.

Utmost simplicity of construction, and reliability under the most severe operating conditions, making the Multi Jet Condenser practically trouble-proof.

Economic Operations, with auxiliaries comprising but one standard Centrifugal Injection Pump, operating with highest hydraulic efficiency.


MULTI JET CONDENSER

SCHWARTZ SECTIONAL SYSTEM

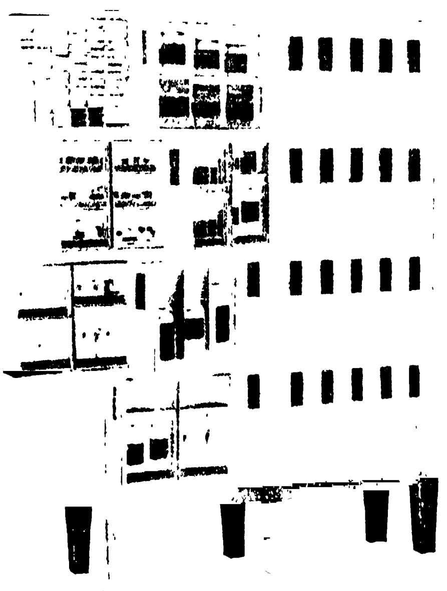
INDIANAPOLIS, U. S. A.

PRODUCT

Schwartz Sectional System of Filing Cabinets for Chemicals, Reagents, Specimens, Samples, and Small or Large Articles in Laboratories and Chemical Storerooms.

UNIT SYSTEM

The system is built up of interchangeable unit sections. All units are finished to match the furniture in the laboratory or office of the purchaser. All subsequent purchases will match and interchange with those previously purchased. No carpenter is required for installation. Each Standard Unit Cabinet contains twenty drawers, and is 24 inches wide, 60 inches high, and 18 inches deep.



TWO VERTICAL SECTIONS ON SANITARY BASE

One partly open, one closed Pat Jan 11, 1910

ADVANTAGES

Saves space, breakage and disorder. Protects the contents from the deteriorating effect of light, dust and laboratory fumes. So stored that the chemical wanted can, by the use of the alphabetical index, be found instantaneously. Provision is made for articles of all sizes. The system is so simple in operation that a new chemist or laboratory helper can find any chemical in the cabinet without asking questions.

MATERIALS AND CONSTRUCTION

Unit Standardized construction so reduces costs as to allow of the best material being used. All drawers are accurately dovetailed, and are warranted not to warp or stick. All drawer pulls, numbers, and card holders are solid brass. The woods used are the best quartered oak and birch, stained mahogany color.

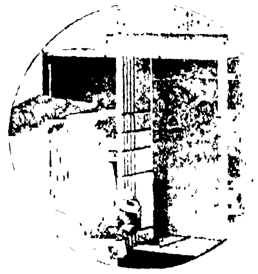
THE INDEX

THE INDEX

After you have loaded the cabinets to your own satisfaction all articles you place in the cabinets are indexed for you in an alphabetical loose-leaf index, which places any item instantly at the finger tips. This service is supplied whenever two or more standard units of the cabinets are ordered.

BASES FOR STANDARD SECTIONS

In addition to the sanitary base shown, bases are furnished containing cupboards, or containing six drawers. The drawers contain adjustable partitions, and will be found useful for the storage of articles in bulk. All fittings are brass. The height of these bases is 24 inches, and the cabinet with base is seven feet in height.



NOTE WITH WHAT EASE THE INTERIOR ARRANGEMENT OF THE DRAWERS CAN BE CHANGED

SOME USERS

American Thread Co
American Hominy Co
Ault & Wiborg Co
American Hard Rubber Co
American Window Glass Co
The Barrett Co
Butterworth Judson Corp
Bessemer Limestone & Cement Co
Bristol Myers Co
Crucible Steel Co of America
Cheney Brothers, "Silks"
College of City of New York
E I du Pont de Nemours & Co
De Laval Separator Co
Detroit Iron & Steel Co
Eastern Malleable Iron Co
Falk Co
General Electric Co
General Tire & Rubber Co
Great Western Sugar Co
General Bakelite Co
Garrett & Co, "Virginia Dare"
B F Goodrich Co
Hershey Chocolate Co
Hudson Motor Car Co
Hyatt Roller Bearing Co
Hercules Powder Co
Heywood Wakefield Co
Henry Heide, Inc
Hollingsworth & Whitney Co
International Nickel Co
Kalbfleisch Corp
Eli Lilly & Co
Lowell Textile School
Lloyd Mfg Co
Murphy Varnish Co
Macbeth Evans Glass Co
Merck & Co
Manhattan Rubber Co
Milton Mfg Co
New Jersey Zinc Co
Norton Company
National Aniline & Chemical Co
National Carbon Co
National Malleable Castings Co
Newport Chemical Works
Ohio Match Co
Pennsylvania Rubber Co
Prest O Lite Co
Procter & Gamble Co
Pennsylvania Coal & Coke Co
Redmanol Chemical Products Co
Stanley Works
E R Squibb & Sons
Standard Oil Co
Strathmore Paper Co
M T Stevens & Sons
Todd Shipyard Corp
U S War Dept
U S Bureau of Chemistry
U. S Bureau of Fisheries
U S Navy Dept
U S Public Health Service
U S Rubber Co
University of Illinois
University of Michigan
University of Purdue
University of Washington
U S Aluminum Co
Van Camp Packing Co
Victor Talking Machine Co
Wagner Electric Co
Westinghouse, Church, Kerr & Co
W Va Pulp & Paper Co
Wisconsin Food Products
Westinghouse Electric Products Co
Yale & Towne Mfg Co
Yale University

SCIENTIFIC INSTRUMENT CO.

Manufacturers, Importers and Exporters
239 East 41st Street
NEW YORK, N. Y.

[illegible]
[illegible]
York

PRODUCTS

Manufacturing and repairing of Scientific Instruments.

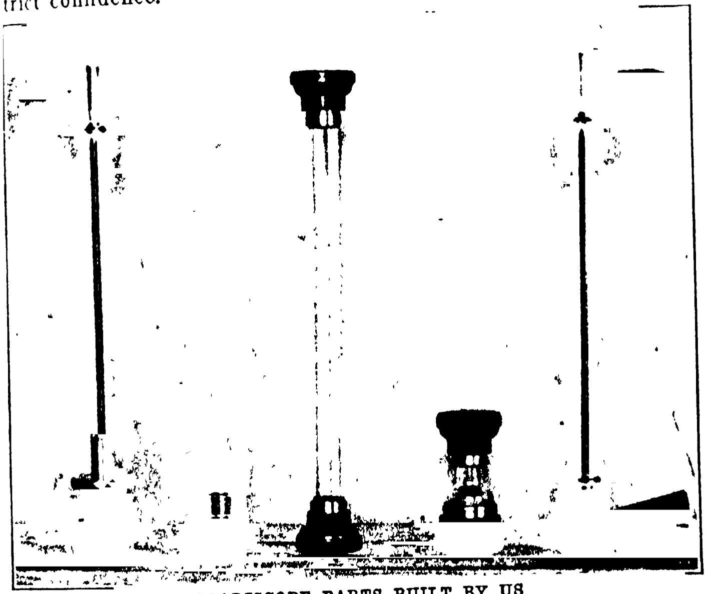
- Polariscopes
- Microscopes
- Spectroscopes
- Polariscope Accessories
- Analytical Balances

Repairing instruments used in

- Surveying
- Astronomy
- Chemistry
- Physics
- Bacteriology
- Medicine, Etc.

Specialists in the design and development of Scientific Instruments.

Experimental Work in the above fields carried on in strict confidence.



POLARISCOPE PARTS BUILT BY US

EXPERIMENTAL WORK

We specialize in the design and development of scientific instruments used in the industries. This work is carried out entirely by our own organization, and is done in strict confidence.

REPAIR DEPARTMENT

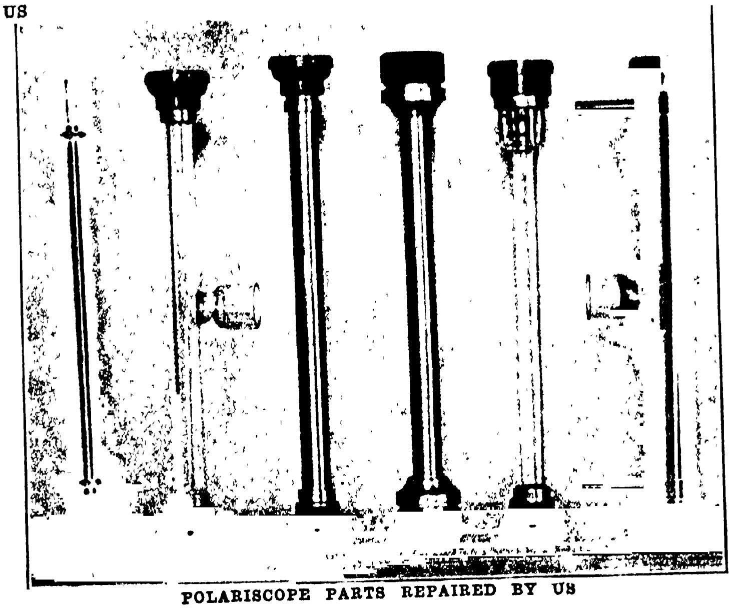
Our repair department has a number of men, expert in their separate fields, who are by experience capable of rebuilding or repairing any scientific instrument.

We have a wide clientele in many lines of repair work in the above classes of instruments, used in the chemical and allied industries, especially among users of polariscopes, microscopes, etc., etc.

MANUFACTURING DEPARTMENT

While we do not build instruments to be sold by our company, we do manufacture them for laboratory supply houses, for chemical companies, and for schools, colleges, and universities.

An example of our work is the Hess-Ives Tint Photometer, which we make for the Palo Company, as well as the Schreiner Colorimeter



POLARISCOPE PARTS REPAIRED BY US

SCIENTIFIC UTILITIES COMPANY, INC.

Manufacturers, Importers, Exporters
18 East Sixteenth Street
NEW YORK, N. Y.

Cable Address
"SUCTIO", New York

Telephones
STUYVESANT 5439
STUYVESANT 157

FACTORY
81 East 10th St

Paris London Alexandria Prague Berlin Mexico City

PRODUCTS

Laboratory apparatus of all kinds, for every need.
Glassware.
Scientific Instruments.
Industrial Laboratory appliances, and accessories.
C. P. Reagents of the Standard manufacturers.

SERVICE

Our service includes supplying every known laboratory requirement. Our stocks are extremely large and complete. Write us and you will find that you are dealing with an organization experienced for years in supplying the wants of the laboratories in all industries.

FACILITIES

We make special apparatus of Glass or Metal for these laboratories from their own designs. We have our own excellently equipped Glassblowing and Thermometer shops and a Metal Instrument factory in charge of experts. We specialize in the manufacture of Chemical hardware.

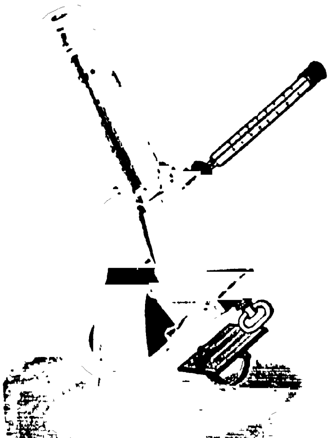
REPAIR DEPARTMENT

This department makes repairs on all laboratory apparatus (Glass or Metal).

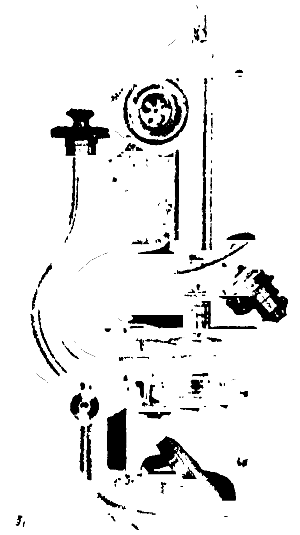
This work saves our customers many dollars in the purchase of new equipment. When you have a lot of equipment assembled for repairs ship it to us, and we will make each piece equal to new.

SCIENTIFIC INSTRUMENTS

Microscopes, Polariscopes, Refractometers and other accessories for investigations and researches are supplied by us promptly.



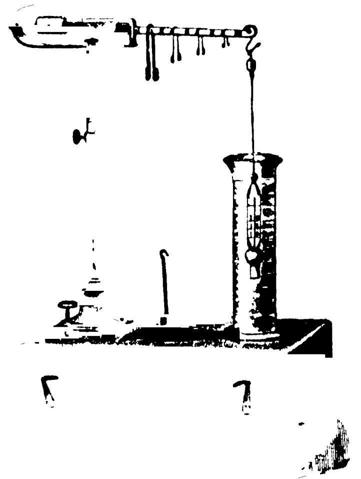
REFRACTOMETER



MICROSCOPE

BALANCES AND WEIGHTS

Beckers' Sons, Troemer's, Voland's, and our own Open Laboratory balances of all reliable makes, for rough weighing.



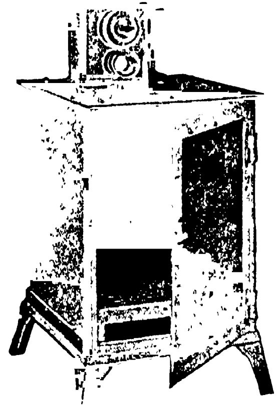
WESTPHAL BALANCE

LABORATORY PUMPS

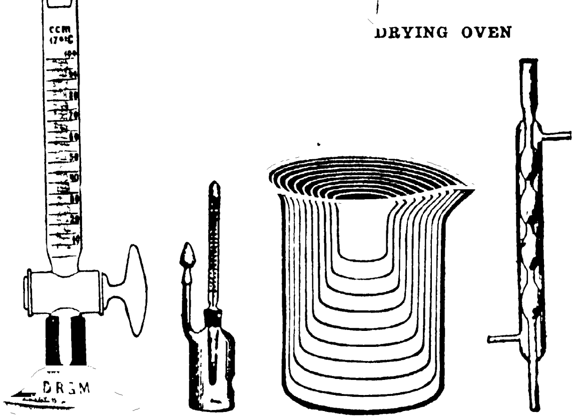
Many types of small pumps for handling liquids, vacuum pumps, hand or power driven for high vacuum, air pumps, filter pumps, etc., are supplied by us regularly to the largest industrial laboratories.

DRYING APPARATUS AND OVENS

Every standard equipment for the above work in laboratories.



DRYING OVEN

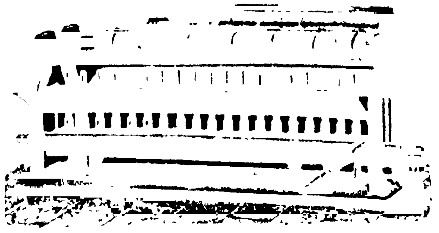


LABORATORY GLASS APPARATUS

Continued on Next Page

FURNACES

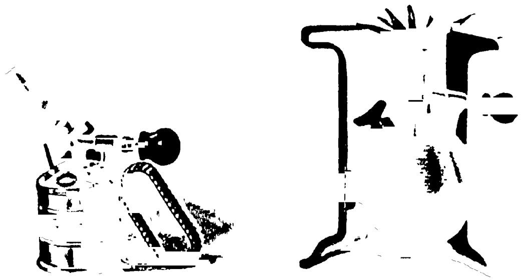
Laboratory furnaces of all standard designs for every possible need.



COMBUSTION FURNACE

BLAST LAMPS AND BURNERS

A complete line of these important pieces of apparatus is carried in stock by us.



BLAST LAMPS AND BURNERS

THERMOMETERS

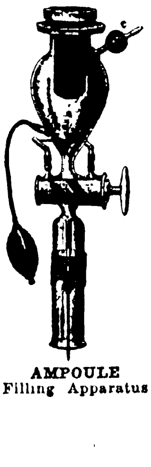
We have experts in our employ who make all types of scientifically accurate thermometers. We have experts on Beckman thermometers and others. We carry at all times a complete stock of industrial and laboratory instruments for general work.

HYDROMETERS

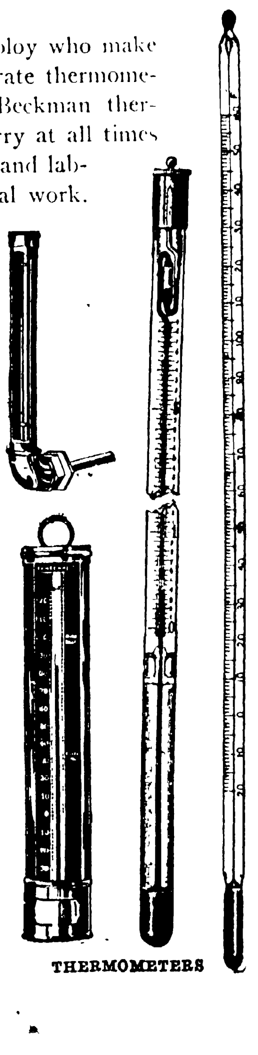
A complete stock of these instruments are always on hand to be used for liquids of every character. These hydrometers can be supplied weighted with shot or mercury, as well as a thermometer scale.

NEW AMPOULE FILLING APPARATUS

Made of Jena Glass, simple and easy to operate. **Ampoules and Vials** furnished in Jena hardglass, flint or amber.



AMPOULE
Filling Apparatus



THERMOMETERS

CENTRIFUGES

Complete line of these important laboratory accessories, hand drive, belt drive, water drive, or motor drive, for centrifuging any product.

LABORATORY CENTRIFUGE

PYROMETERS

Standard types of these instruments can be supplied, including the electrical connections and other appurtenances.

DISTILLING APPARATUS

Of Metal or Glass for every laboratory use. Barnstead Automatic Water Still; James Water Still; Jewell Water Still; Kolbe's for liquids under reduced pressure, etc.

Glass Stills Our Specialty.

SPECIFIC GRAVITY INSTRUMENTS

Specific Gravity bottles of every type and any required c.c. capacity, together with thermometer stoppers. These instruments are standard and are graduated to the greatest accuracy.

EXTRACTION APPARATUS

Complete stocks of all the various standard designs are on hand.

Soxhlet, Freybling, Hagemann, Kempf, Kreussler, Lebmann, Breumer, Pip, Wiley, Kutscher and Stendel's, as well as the new Underwriter's form as described in the J. Ind. and Eng. Chem. IV. No. 7, June, 1912.

GAS ANALYSIS APPARATUS

All equipment necessary for this work can be supplied by us from stock.

PLATINUM LABORATORY SUPPLIES

These can be had from us. Crucibles, Cups, Dishes, Thermo-couples, as well as platinum lined calorimeters.

MELTING AND FREEZING POINT APPARATUS

Beckman's and other types.

PORCELAIN AND RUBBER GOODS

These supplies are carried in stock by us and cover every demand of the laboratory.

CEMENT TESTING APPARATUS

We are headquarters for the standard apparatus for testing cement, which includes all methods approved by the American Society of Testing Materials.

ERNEST SCOTT & CO.

FALL RIVER, MASS.

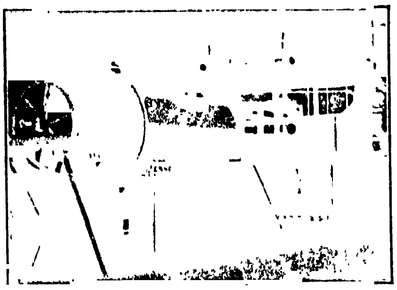
KINGSWAY HOUSE, LONDON, ENG. GLASGOW BUENOS AIRES COLOMBO SINGAPORE

PRODUCTS

Apparatus for Recovery of Coke-oven and Coal-tar Products—Benzol, Toluene, Sulphate of Ammonia, etc.
Caustic Soda Recovery Apparatus
Complete Plants for Distillation of Wood
Glycerine Recovery Apparatus; and Refining Apparatus
Oil Extraction and Recovery Apparatus
Paper-makers' Liquor Recovery Apparatus
Solvent Extractors; Solvent Recovery Apparatus
Autoclaves
Digesters
Distilling Apparatus
Dryers
Filters
Impregnators
Insulators
Mixers
Rotary Incinerators
Stills
Vacuum Condensers
Vaccum Dryers
Vacuum Evaporators
Vacuum Pumps
Vacuum Melting and Digesting Apparatus

OIL EXTRACTION AND RECOVERY

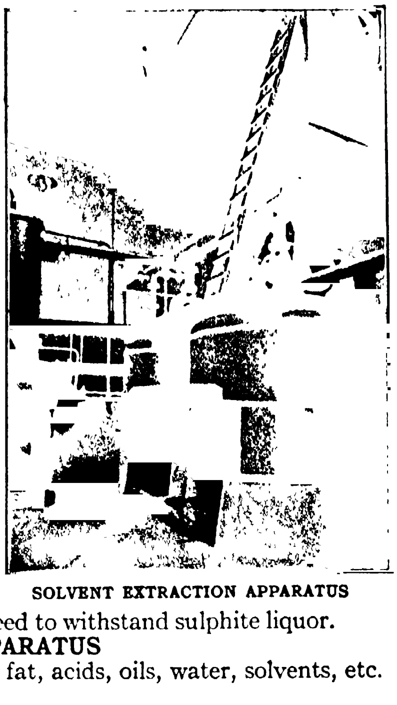
From packing house tankage, bones, seeds, leather scraps, skins, filter-press cakes, engine wipes, linters, cotton waste and residues of all kinds.



OIL EXTRACTION AND RECOVERY APPARATUS

SOLVENT RECOVERY

From the processes of varnish and explosives manufactures, rubber-coating machinery, dry cleaners' spent spirit, etc.



SOLVENT EXTRACTION APPARATUS

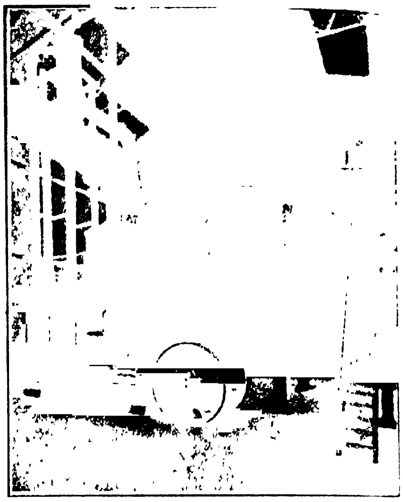
SULPHITE LIQUOR RECOVERY

These plants are similar to our soda recovery plants but are constructed of a specially treated acid metal guaranteed to withstand sulphite liquor.

DISTILLING APPARATUS

For dealing with fat, acids, oils, water, solvents, etc.

VACUUM EVAPORATORS



VACUUM EVAPORATOR

For economically and rapidly concentrating all liquors. Any liquor dealt with. Several thousand installations now at work.

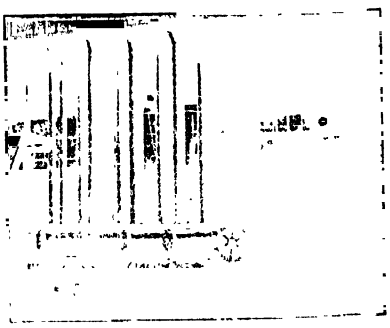
These plants are specially adapted for recovering caustic soda in pulp and paper mills and explosive plants and for treating the spent washings of mercerizing plants

VACUUM DRYERS

Stationary, rotary and continuous installations. The various types being specially designed for drying rubber, cocoa, coffee, fruit, vegetables, milk and other food products, fish, blood, glue, gelatine, seeds, grains, pencil and other woods, colors, dyes, extracts, etc.

GLYCERINE RECOVERY

From soap lyes and Twitchell sweet water at a cost as low as $7.50 per ton of glycerine, this allowing for fuel, labor and chemicals. Recovery can be obtained even more economically where exhaust steam is available. Multiple effect apparatus supplied for larger sizes. Each equipment is a complete plant including tanks, pipes, filter press, steam-driven force pump, patent evaporator with all fittings including salt extractor, vapor pipes, catch vessel and fittings, jet condenser and steam-driven vacuum pump.



GLYCERINE REFINING APPARATUS

GLYCERINE REFINING

These plants will yield Dynamite Glycerine in one distillation from Soap Makers' Glycerine and C. P. Glycerine in two distillations; from Saponification Glycerine C. P. Glycerine can be obtained in one distillation, from Distillation Glycerine partly C. P. Glycerine and partly Dynamite Glycerine can be obtained in one distillation at a cost of distillation of about $5.00 per ton, the yield being within 2% of the actual quantity treated

SCRANTON GLASS INSTRUMENT COMPANY

322 WASHINGTON AVENUE, SCRANTON, PA.

[illegible] Madison Avenue, New York, N. Y. 845 Washington Blvd., Chicago, Ill

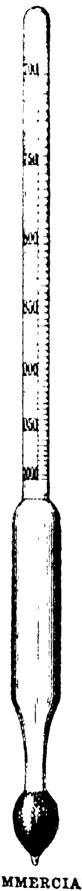
Consolidated with
ACCURATE THERMOMETER COMPANY
SCRANTON HYDROMETER COMPANY
M. WEISKOPF THERMOMETER COMPANY

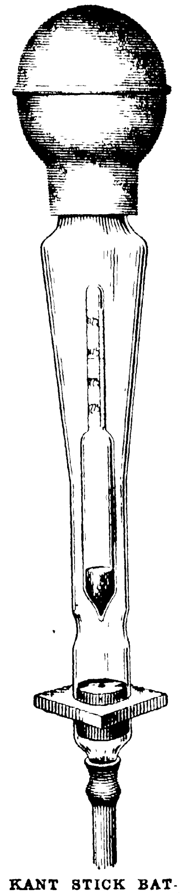
PRODUCTS

Hydrometers and Thermometers to meet all requirements.

HYDROMETERS FOR ALL PURPOSES

- Baumé
- Balling
- Brix
- Tralle
- Twaddle
- Internal Revenue
- U. S. Custom House
- Lime and Sulphur
- Calcium Chloride
- Battery (7 Types)
- Oil
- Ether
- Gasoline
- Glue
- Glycerine
- Milk
- Naphtha
- Salometer
- Saccharometer
- Specific Gravity
- Syrup
- Sugar
- Urinometer
- Pyro Alcohol Radiometer
- Ammonia
- Actionometer
- Chlorine
- Lye
- Shellac


COMMERCIAL TYPE


KANT STICK BATTERY HYDROMETER

SERVICE

The material used in the manufacture of our products is the best we can obtain. Our scales are made by experts. Every instrument is tested and retested before leaving the factory. Any instruments which are not satisfactory in every way are accepted in return by us and full credit is given.

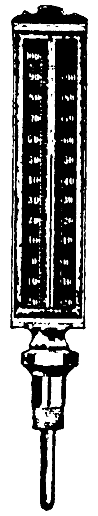
LITERATURE

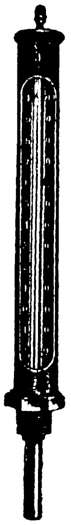
Catalogs, Bulletins and Folders on application.

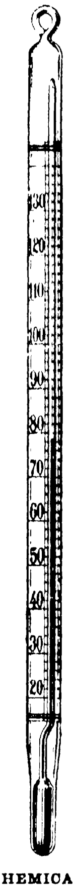
THERMOMETERS FOR ALL PURPOSES

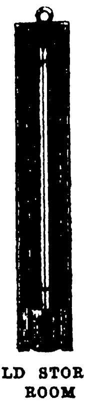
- Armored
- Beef Packer
- Bakers
- Bake-Oven
- Battery
- Brine Pipe
- Calorimeter
- Canners
- Chemical
- Cold Storage
- Confectioners
- Dairy
- Distillers
- Dough Testing
- Electric Alarm
- Egg Room
- Ice Machine
- Glass
- Kettle
- Laboratory
- Marine
- Mash Tub
- Oil
- Packers
- Picklers
- Pocket
- Precision
- Railway
- Shiphold
- Sugar
- Titer Test
- Vulcanizing
- Weather Bureau

- Brass Case
- Bronze Case
- Copper Case
- Tin Case


MECHANICAL THERMOMETER


THERMOMETER FOR ICE MACHINES AND BRINE TANKS


CHEMICAL THERMOMETER


COLD STORAGE ROOM THERMOMETER

SPECIAL FEATURES

We make a specialty of imprinting your name in our various types of hydrometers and hydrometer syringes. We are also able to pack all instruments in individual metal edge fiber board boxes with your name and trade-mark imprinted on each box.

SHEPARD ELECTRIC CRANE & HOIST CO.

MONTOUR FALLS, NEW YORK

BRANCH OFFICES

New York
Baltimore
Christiania
Philadelphia
Cleveland
Stockholm
Chicago
San Francisco
Barcelona
Cincinnati
Pittsburgh
Montreal
Genoa
Boston
Melbourne
Paris

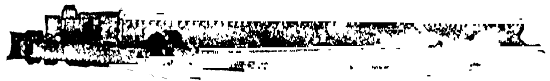
PRODUCTS

Traveling Cranes to 50 tons capacity; Electric Hoists and Monorail Cranes ½ to 30 tons capacity; Double Monorail Tracks; Trolleys; Electric Back Geared Winches; Electric Cargo Winches; Electric Ship Winches; Electric Capstans.

SHEPARD ELECTRIC CRANES AND HOISTS

Construction—Shepard Electric Cranes and Hoists are designed to meet the demand for a type of electric hoisting equipment equally adaptable to both indoor and outdoor service and requiring no unusual degree of skill for either its care or operation.

The hoisting mechanism of all Shepard Cranes and Hoists is of the "unit-construction" type. Electric motor, gearing, hoisting drum and brake are contained within a heavy iron housing that is not only dirt, dust and moisture proof but safeguards all operative parts from fumes and injury. Another important feature is that the operating gears run in oil baths.

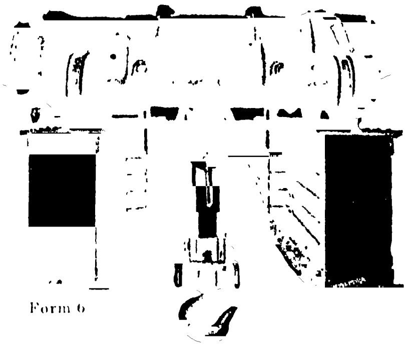


BRIDGE CONSTRUCTION

The Shepard idea of providing complete protection and automatic lubrication is carried throughout Shepard Cranes.

SHEPARD STANDARD TYPE CRANE TROLLEY

The Trolley illustrated herewith provides a bath lubrication, complete dirt exclusion and permanent alignment for the gearing, brakes and motor.



SHEPARD STANDARD TYPE CRANE TROLLEY

SHEPARD MONORAIL ELECTRIC HOISTS

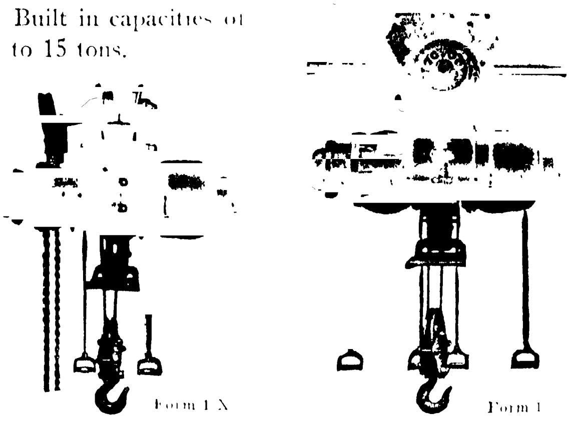
Cage Controlled Hoists—These Hoists equipped with automatic buckets are widely used in many lines of industry for rehandling coal, raw products and other materials. Shepard enclosed trolley and gears and bath lubrication is of supreme importance for this service.

Floor Controlled D. C. Hoist—This Hoist consists of a motor driven geared trolley. Especially useful where loads must be carried distances too long for the workmen to push along the I-beam track.

SHEPARD CAGE CONTROLLED MONORAIL ELECTRIC HOIST

The illustrations below show two forms of Shepard Monorail Hoists; one with the axis of the winding drum parallel to the line of the travel and the other at right angles to it.

Built in capacities of 1 to 15 tons.



SHEPARD FLOOR CONTROLLED MONORAIL ELECTRIC HOISTS

MONORAIL SYSTEMS

We furnish switches, tracks and complete equipment for Monorail systems.

ENGINEERING SERVICE

We offer the free services of our engineers in aiding to solve any hoisting or rehandling problem.

CATALOGS OF VARIOUS TYPES

MONORAIL CONSTRUCTION

A few typical Shepard Cranes and Hoists are shown here but an idea of the scope of our line may best be obtained by sending for Catalog which illustrates Traveling Cranes, Monorail Cranes, Winches, and various applications of electric hoists.

SHERWOOD MANUFACTURING COMPANY

Brass Founders and Finishers

SOLE MANUFACTURERS OF

SHERWOOD ENGINEERING SPECIALTIES

1702-1716 ELMWOOD AVENUE, BUFFALO, N. Y.

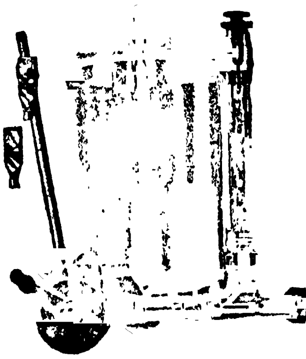
BRANCH OFFICES

York 220 Broadway   Boston 49 Federal Street   London Green & Boulding Ltd., 28 New Bridge Street E. C.

PRODUCTS

Sherwood and Buffalo Automatic Injectors, Eagle Ejectors, Hart Force Feed Oil Pumps, Felthousen Hand Cylinder Oil Pumps, Buffalo Cylinder Oil Pumps, Buffalo Glass Body Oil Cups, Niagara and Sherwood Oil and Grease Cups, Engineer's Favorite and Duplex Flue Scrapers, Favorite Steam Flue Blowers, Felthousen Ball Gauge Cocks, Oxygen and CO_2 Cylinder Valves, Machined Brass Work to Specifications and Brass and Bronze Castings.

"HART" FORCE SIGHT FEED OIL PUMP



SINGLE FEED

For Force Feed Lubrication of Steam Engines, Steam Pumps, Air Compressors, etc. Each sight feed has independent needle-valve, permitting fine and accurate regulation of minimum quantity of oil required at each point of lubrication, and eliminating waste. Plungers have constant length stroke, regardless of amount of oil fed to cylinders or bearings. Large, easy reading sight feed glass, always at atmospheric pressure. All "Hart" Pumps tested against steam pressure before shipment.

Capacity of "Hart" pumps is ½ pint to 1 gallon The "Hart" is made in four styles Polished brass finish, nickel plated, rough brass finish, and glass body The pump is built with one, two, three, four and five feeds.

ACID EJECTORS FOR CHEMICAL WORKS

Operated by steam pressure. Iron body lined with hard lead.

This appliance is made to handle sulphuric acid or any other liquids that attack iron or brass.

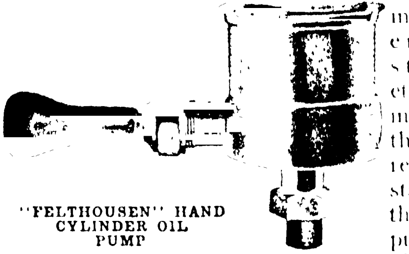
ACID EJECTOR

It is recommended that the ejector be located a foot or two above the liquid, so that the acid or other liquid which has to be lifted by the ejector will drain out when not in use.

DIMENSIONS

Size of Pipes		Capacity per Hour, Gallons
Steam	Liquid	
½ or ¾ in	1 in.	425
¾ or 1 in.	1½ in.	1050
1 in.	2 in.	2600

THE "FELTHOUSEN" HAND CYLINDER OIL PUMP



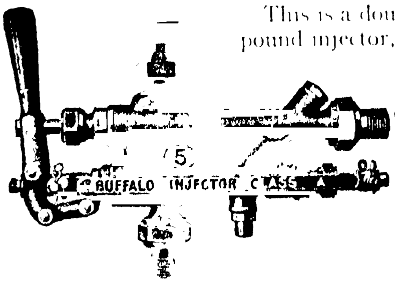
"FELTHOUSEN" HAND CYLINDER OIL PUMP

For lubricating cylinders of engines and steam pumps, etc; so simple in construction that anyone can readily understand how to use them These pumps have two check valves between oil and steam. Perfectly made and elegant in finish Many thousands of these oil pumps are in use giving perfect satisfaction. Every engine should have one of these pumps whether it is provided with an automatic lubricator or not

DIMENSIONS

	Brass Body					Glass Body			
No. Side Outlet	3	04	4	8	5	3	04	4	5
No. Bottom Outlet	03	6	7	9		03	6	7	–
Capacity in Pints	⅛	¼	½	1	3	¼	½	1	3
Pipe Thread in Inches	⅛	⅜	⅛	⅜	½	⅛	⅜	⅛	½

THE "SHERWOOD" INJECTOR, CLASS "A"



"SHERWOOD" DOUBLE TUBE INJECTOR

This is a double tube or compound injector, comprising two sets of jets, one set acting as an ejector, lifting water and supplying same to the second set of jets which do the forcing

The "Sherwood" Class "A" Injector is operated by one lever, and works on any pressure from 25 to 200 lbs or more Will lift water 24 feet under proper conditions, and will handle hot water It requires no valve in either steam or suction pipe, it is easy to connect and easy to operate, and is recommended where a wide range of work is required

DIMENSIONS

Size	Size Connections		Gallons per Hour	Horse Power
	Suction and Delivery	Steam		
5	½	½	130	8 to 12
5½	½	½	180	12 to 25
7	¾	¾	250	20 to 35
9	¾	¾	350	30 to 45
9½	1	¾	450	40 to 60
11	1	1	575	60 to 80
13	1¼	1	725	75 to 100
13½	1¼	1¼	900	90 to 125
15	1½	1¼	1260	120 to 175
15½	1½	1¼	1700	150 to 235
17	2	1½	2200	200 to 300
19	2	1½	2800	250 to 360
21	2½	1½	3500	350 to 500
23	3	2	5000	750 to 950

T. SHRIVER & COMPANY

Established 1860

Filtration Engineers and Manufacturers of Filter Presses

851 HAMILTON ST., HARRISON, N. J.

PRODUCTS

Filter Presses of all kinds for all purposes; Filter Cloth; Filter Paper; and Filter Press Pumps.

SERVICES

While this catalog shows many different types and sizes of our standard filter presses, nevertheless, we are continually required to design filter presses for special purposes, and our experience in this line is at your disposal.

If you have a product that can not be filtered by ordinary methods, call upon us. In any event, do not abandon the idea of filtering your material until we have had an opportunity to investigate it.

Our success in special filter presses has made us headquarters for customers who have encountered problems which they have been unable to solve.

We solicit your patronage and make no charge for our experiments.

CONSTRUCTION FEATURES

Drainage Surface—All Shriver filter plates are made with the improved pyramid drainage surface This surface is over 30% more efficient than any other type of drainage, as it holds the cloth away from the surface of the plate, allowing free passage of the filtrate through and back of the cloth.

Leakage—The plates and frames of Shriver presses are machined on specially constructed tools which assure absolutely even, parallel joint surfaces, file finished, and accurate

Outlet Cocks—Our standard quick-action flap cock is recommended for filter press outlets When closed they withstand a pressure of 200 lbs per sq in without leakage Other styles of outlet cocks are supplied on some of our special designs of presses

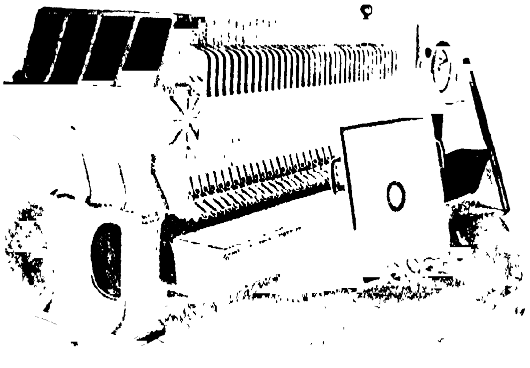
Opening and Closing Devices—Our hand operated device for opening and closing the press is simple to work and is quick. The larger presses are equipped with gear and pinion closing device together with the ratchet, insuring absolutely tight closing with little exertion

Where there are large installations such as a battery of presses we recommend our Hydraulic Closing Device by which the whole battery can be opened or shut in one operation.

TYPES

The results that will be obtained from any application of filter presses is determined largely by the selection of the type of machine best adapted to the work for which it is intended.

Type B—Square, Center Feed, Open Delivery, Non-washing, Recessed Plate Filter Press. The Center Feed Press finds extensive application in processes where washing of the cake is unnecessary and for filtration of very thick material which might tend to clog the ports of the flush plate and frame type described later.



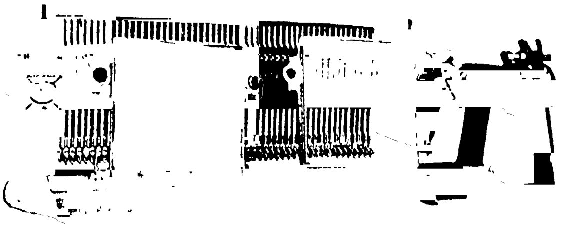
TYPE B

The solution to be filtered is pumped into the chambers through the channel in the center of the Feed. Distance frames are supplied when it is desired to have cakes more than 1¼ inches thick.

Type C—Square, Center Feed, Open Delivery, Washing, Recessed Plate Filter Press. This type is identical in construction and operation with Type B, but is provided with a special washing channel for washing the cake remaining in the press.

Type D—Side Feed, Open Delivery, Non-washing, Flush Plate and Frame Filter Press. This Side Feed Filter Press is the same in design as Type E, excepting that there is no provision made for washing the cakes in the press. This type of press is particularly adaptable to the filtration of vegetable oils and the clarification of liquids wherein the use of paper as a filtering medium is desired.

Type E—Square, Side Feed, Open Delivery, Washing, Flush Plate and Frame Filter Press. The Side Feed Filter Press is probably the most improved and highest developed filter press on the market. The many features of superiority of this type over all others received instant recognition and resulted in the almost universal adoption of this type wherever its application has been possible.



TYPE E. SIDE FEED FILTER PRESS

The chambers are formed by distance frames placed between the flush plates and may be varied by using frames of different thickness. This design makes it unnecessary to cut holes in the cloths and the clothing of the press is a simple operation. It is only necessary to cut the cloths to the proper lengths and fold them over each plate.

Type F—Square, Corner Feed, Two-Eyed, Open Delivery, Washing, Flush Plate and Frame Filter Press. In this type an eye or hole in one corner of the plates and frames forms a channel for the introduction of material to be filtered. Another eye in the opposite corner serves for the washing or lixiviation process. Frames can be made for cakes of any desired thickness.

Paper as well as cloth can be used as a filtering medium and the press is easily clothed by folding the cloths over the plates, no fasteners being required Holes are cut in the cloths to correspond with the holes in the plates.

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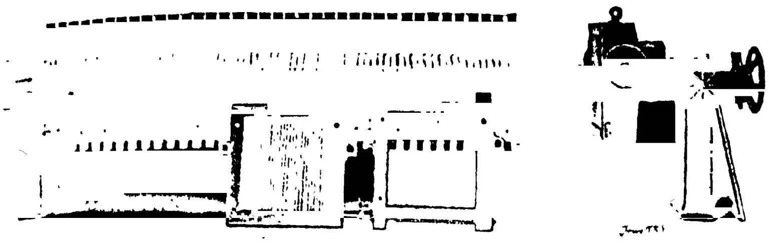
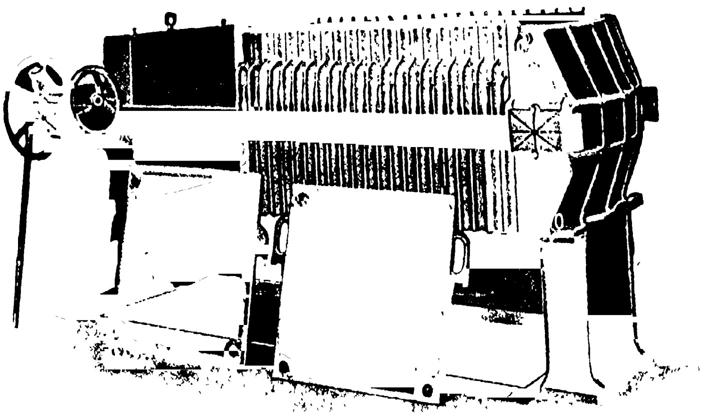


TYPE K. WOODEN CHAMBER FILTER PRESS

Type G—Square, Corner Feed, Three-Eyed, Closed Delivery, Flush Plate and Frame Filter Press. The Three-eyed Press is particularly adapted to the filtration of volatile liquids, as the filtrate is discharged through a channel at one corner of the head and, therefore, can be kept from exposure to the atmosphere.

Type H—Square, Corner Feed, Four-Eyed, Washing, Flush Plate and Frame Filter Press. The Shriver Four-eyed Press is a closed delivery washing press which meets every emergency to which a filter press can be put. Frames can be made of any depth to produce cakes of the required thickness. The cakes can be washed or treated with chemicals while in the press.



TYPE G

The filtrate is delivered through a closed channel, permitting the filtering of volatile liquids.

Type K—Wooden Chamber Filter Press. In the many varied branches of chemical industry of to-day, it is frequently necessary to effect the rapid filtration and clarification of acid solutions or materials influenced by contact with iron.

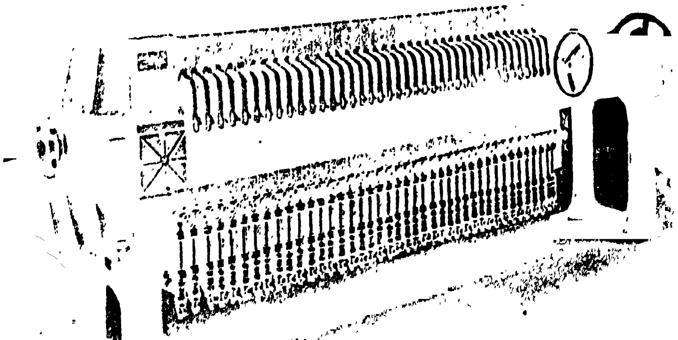
The Shriver Wooden Chamber Filter Press stands foremost in the field of acid filtration. It is so constructed that the solution being filtered does not come in contact with anything but wood or acid-resisting material at any time during the process of operation. The plates and frames are usually made of selected yellow pine, but can be constructed of any wood that may be desired for any special work. Shriver Wooden Chamber Filter Presses are made in all types, sizes and capacities.

Especial attention may be called to the new Shriver panel type of plate only recently perfected. The plates are made with a loose center internal expansion feature which greatly minimizes the customary changes caused by the drying and swelling of the wood. These plates are provided with the double washing feature which effects a rapid and thorough washing of the cake.

Type L—New Model Varnish Filter. This press is a square, three-eyed, flush plate and frame type filter press equipped with solid, slightly recessed frames which reduce the holding capacity over 87 per cent without lessening the filtering area.

After filtration the Varnish remaining in the chambers of the press, being small in quantity on account of the solid frames, is filtered through an auxiliary chamber which holds about three gallons. After filtering the varnish from the main body of the press through this chamber until filtration ceases, the unfiltered Varnish is drawn off through an outlet cock provided for this purpose, leaving only about three gallons of unfiltered Varnish from a batch.

Type B-S—Center Feed Closed Delivery Visible Discharge Filter Press. The Closed Delivery Visible Discharge Filter Press is equipped with a gauge glass, valve, and pet cock on each plate. The filtrate passes through the gauge glass before entering the common outflow channel. Should a cloth break, causing the liquor to run cloudy, this condition is plainly seen by the operator and the filtrate from that chamber can be shut off by closing a valve just above the gauge glass, without interrupting the action of the remaining chambers.



TYPE B-S

FILTER PRESS PUMPS

There is no more important item in a filter press installation than the apparatus which is best suited to pump the liquid to the presses. We have the best pumps for our types of filter press. They can be steam, motor, or belt driven.

SIMMONS PIPE BENDING WORKS

Main Office: 10 Mechanic Street
Factory and Warehouse: Avenue D and Murray Street
NEWARK, N. J.

PRODUCTS

- Pipe Bends
- Pipe Coils
- Van Stone Joints
- Piping Specialties

SERVICES

We have complete engineering and fabricating facilities for carrying out the largest of piping installations and we give the same attention to the small order. Upon request we will gladly furnish estimates from your specifications.

BENDS

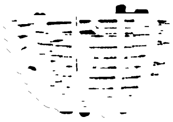
We make a specialty of Pipe Bends from special pipe manufactured for this purpose. These bends can be produced by us in any size and shape for high and low pressures. Where desired the ends can be swaged down and the nozzles welded in any position, to fit any kettle, tank or other apparatus.

A GROUP OF OUR BENDS AND FLANGED PIPE

PIPE COILS

Made in steel, iron, brass or copper pipe. We are building these coils for use in a number of different industrial operations where special conditions are encountered in each installation. These coils can be built to your specifications.

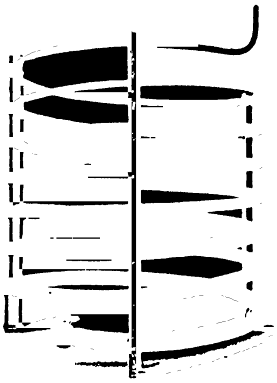
OBLONG TAPER COIL



BASKET COIL

REDUCING COILS

These coils are built for every industrial use d Uniform reduction in diameter of the coil thro its length gives maximum efficiency and freedom pockets where condensed vapors could becom trained.

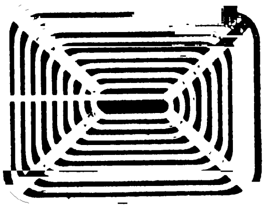


REDUCING COIL

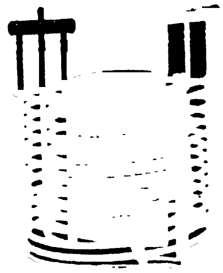
WATER HEATER AND COIL

AUTOCLAVES

We build Autoclaves with the outer shell of any size up to 30 inches, with the coil made up and welded



FLAT COIL



CONDENSER COIL

THE ORVILLE SIMPSON COMPANY

Manufacturers of Grinding and Sifting Machinery

1250 KNOWTON ST., CINCINNATI, O.
EXPORT OFFICE: 3 Cedar St, New York

PRODUCTS

Roller Mills, Crushers, Buhr Stone Mills, Centrifugal Bolting Reels, Hexagon Bolting Reels, Rotex Sifters, Dufour Silk Bolting Cloth, Wire Cloth, Mortise Gearing, Conveyors, Elevators and Mill Supplies. French Buhr and American Buhr Mill Stones.

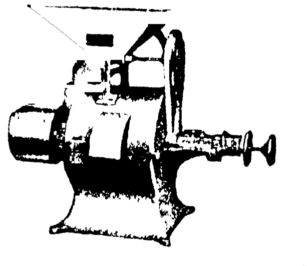
We make a specialty of grinding and corrugating rolls used in roller mills, paint mills, ink mills, etc.

RAINBOW CRUSHER

RAINBOW CRUSHER
13" x 16" x 16" Capacity

Our Rainbow Crusher is an ideal machine for reducing Filter Press Cakes, Clays, Chemicals, and all materials requiring crushing before being pulverized. Crushing cones can be readily changed when worn. Has large capacity and crushing fineness can be easily regulated when running.

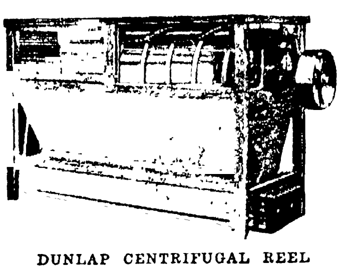
EXPORT BUHR MILL


EXPORT MILL
15", 18" and 21" Stones

Made in three sizes with vertical French Buhr stones 15", 18" and 20" in diameter. Discharges at side or bottom. Designed for rapid grinding of Chemicals, Drugs, Food Products, Minerals, Paints, etc. Other buhr mills built with stones from 6" diameter up to 48" diameter.

DUNLAP CENTRIFUGAL REEL

A reel with a cloth stretch ring, brushes inside and outside of bolting cloth and a tight inside cylinder. Suitable for bolting Dry Chemicals, sulphur, starch, face powders, and all similar products. This machine is positive in its bolting action and will handle the most difficult materials.


DUNLAP CENTRIFUGAL REEL

DIMENSIONS AND PRICES

Size	No 2	No 3	No 4
Length of Frame	6'8"	8'1"	8'6½"
Length over all	8'1"	9'8½"	11'4"
Height of Frame	4'3¼"	4'3¼"	5'5"
Width of Frame	2'9¼"	2'9¼"	3'6"
Diameter of Reel	26"	26"	34"
Circumference of Reel	82"	82"	107"
Length of Cloth	65"	87"	87"
List Price, Subject to Discount.	$220 00	$250 00	$280 00

Reel cloths not included in above prices
When ordering, specify right or left hand machine.

ROTEX

The Compact Sifter

NO 76 A 1 ROTEX

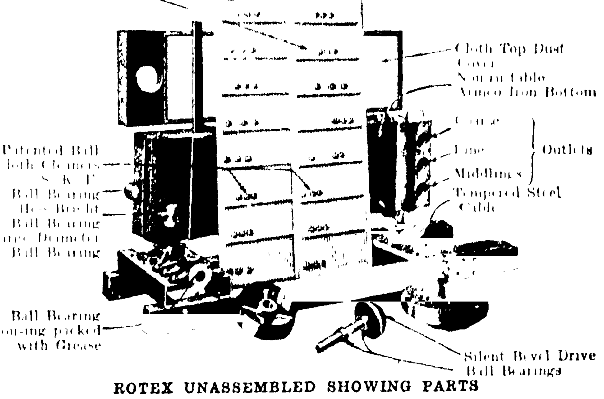
The Rotex Sifter operates with a level rotary sieve motion and incorporates a patented ball cloth cleaning device rendering it suitable for sifting fine, soft and sticky materials.

The Rotex is very compact, is easily installed, requires very little power and is dependable. The convenience of the removable sieves in the Rotex and the fact that even the finest mesh sieves do not clog on account of the thorough tapping action of the patent ball cloth cleaners, contribute to make the Rotex particularly suitable for chemists' use.

Soda, salts, oxides, alum, talc, chalk, graphite, bone, earths, and all dry products are readily sifted.

The Rotex is built in several sizes for making two or more separations. An all metal Rotex is built for wet sifting.

The driving mechanism is mounted on five high grade ball bearings which eliminate mechanical troubles and reduce power consumption. Write for Rotex Bulletin



ROTEX UNASSEMBLED SHOWING PARTS

DIMENSIONS AND PRICES

Size	76 A 1	76 E 1	19 A 1	49-B 1
Number of Sieves	2	1	2	2
Square Feet of Cloth or Screen	21 6	23 3	9 5	8 8
Number of Separations	3	2	3	2
Extreme Height, Inches	27	27	24	27
Width, Pulley at Side, Inches	30¾	54	24	24
Length, Pulley at Side	7'10"	8'6"	5'5"	5'5"
Shipping Weight, Lbs	500	700	250	250
List Price, Subject to Discount	$315 00	$360 00	$95 00	$100.00

THE SMITH GAS ENGINEERING CO.

Builders of Smith Gas Producer Plants

DAYTON, OHIO

SOLE CANADIAN REPRESENTATIVES CANADIAN ALLIS-CHALMERS, LTD. TORONTO, ONTARIO

PRODUCTS

Producer Gas Plants to operate on bituminous coal, anthracite coal, coke, charcoal and lignite. Producer Gas Power Plants to operate on the above fuels. Producer Gas Fuel Plants to furnish clean gas for metallurgical and chemical operations and processes requiring the application of heat.

Gas Cleaning Plants.
Smith Glass Wool Tar Extractors.
Recording Gas Calorimeters.
Gas Valves.

EXPERIENCE

The Smith Gas Engineering Co. is a pioneer in gas producer work, Smith suction gas producers having been in successful commercial operation since 1902. Over 100,000 h.p. have been installed, ranging in size from 25 to 3,000 h.p. in single units, operating on a wide range of fuels, and furnishing gas for both power and heating. The company numbers among its customers some of the largest and best known manufacturers in the country, who installed Smith producers after thorough and detailed examinations by their own engineers, which showed the remarkable economies to be obtained by their use.

ECONOMY

The increasing scarcity of fuels of all kinds, particularly oil and natural gas which are so extensively used by chemical plants, makes it imperative for every industry to use the most economical fuel in the most efficient manner. Producer-gas is to-day firmly established as a highly efficient agent for industrial heating and (when used with the gas engine) for power. Since it is a direct product of coal the most widely distributed and, basically, the most economical fuel, its continued economy is insured.

COLD CLEANED GAS

All Smith plants supply a uniform quality of cleaned gas which can be distributed from one central plant to any distant point just as natural or city gas is distributed; no large refractory ducts are necessary as when "hot" or "raw" gas is used; no clogging of mains.

SPECIAL FEATURES

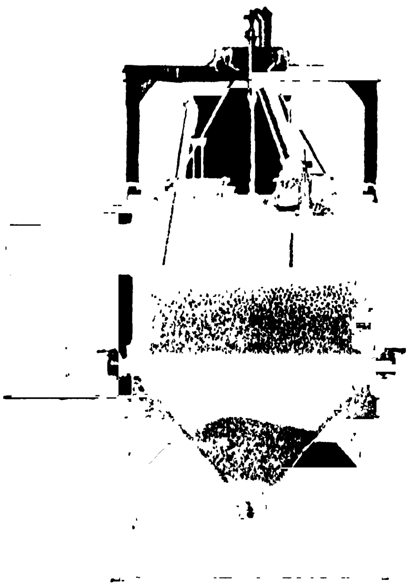
(a) All Smith Gas Plants operating on bituminous coal or lignite are equipped with the Smith Glass Wool Tar Extractor guaranteed to be 99.5% efficient.

(b) All tar extracted from the gas is returned to the producer and converted into a fixed gas. This adds greatly to the over-all efficiency of the plant and the quality of the gas delivered.

(c) All Smith producers are equipped with automatic means of proportioning air and water vapor in the blast. This insures a very uniform gas quality on varying loads.

HEAVY-DUTY PRODUCERS FOR BITUMINOUS COALS (Type "G")

The Type "G" is a high-duty bituminous producer, **mechanically operated** to meet the present day demand for large gas capacity with low labor The process of gas production is similar to th other Smith Plants and the Smith Glass Wool Extractor (Type "F") is used to clean the gas



SECTIONAL VIEW OF 16' SMITH TYPE "G" PRODUCER EQUIPPED WITH MECHANICAL COAL FEED AND STEAM OPERATED POKERS

Producers Built in Three Sizes

A steam operated poker is incorporated in a rotating turret mounted on the producer top, which top also revolves. As the turret and top rotate, the poker constantly pierces the fuel bed so that every portion is poked during a complete revolution. The illustration shows the position of the poker when withdrawn and the dotted lines indicate its position when extended. The diagram shows how effectively the mechanical poking device does its work. Mechanical poking permits a higher rate of gasification and insures a more uniform porosity in the fuel bed than is possible with the hand poked type of producer, with the result that distillation is more thorough and efficiency consequently higher.

Type "G" units are made in sizes of 9 to 16 ft. diameter, capacities 800 to 3000 lbs. of coal per hour. Described in Bulletin 16.

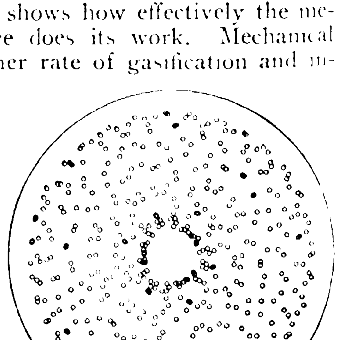
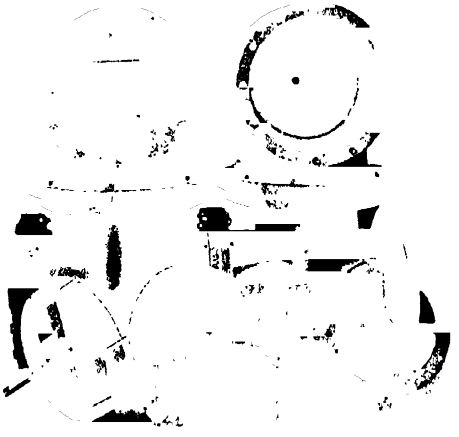


DIAGRAM SHOWING AUTOMATIC POKER OPERATION FOR ONE HOUR OF OPERATION. NOTE THOROUGHNESS OF POKING.

Continued on Next Page

HAND OPERATED PRODUCER FOR BITUMINOUS COALS AND LIGNITE (TYPE "BF")

The "BF" producer is designed to operate on bituminous and lignite coals. The cleaning equipment consists of the Type "F" tar extractor (illustrated below) in addition to usual type of baffle scrubber. The scrubber is used only to cool the gas. Gas is drawn from the producer by a positive exhauster and forced through the Type "F" tar extractor. The tar enters this diaphragm in the form of fog floating in the gas. During its passage through the diaphragm it is agglomerated into large drops which fall out of the gas current, by gravity, into trap provided for that purpose. Described in Bulletin 17.



DISMANTLED VIEW OF THE SMITH TYPE "F" TAR EXTRACTOR

Showing Diaphragm and Glass Wool

OTHER TYPES OF PRODUCERS

Type "E" Producer is designed to operate on anthracite.

Type "EP" Producer is designed to operate on charcoal or coke.

PRACTICAL USES FOR SMITH CLEANED GASES

Smith Producer Gas is widely used in the chemical industry for roasting dyes, distilling and evaporating liquors, oils, etc., electrochemical operations, and for lead furnaces; also for a wide range of metallurgical services and industrial heating and cooking in general.

When used in efficient producer gas engines the fuel consumption does not exceed $1\frac{1}{4}$ to $1\frac{1}{2}$ lbs. per B.H.P. hour except in the case of lignite, when the fuel consumption will average 2 to $2\frac{1}{2}$ lbs. because of the high moisture content of this fuel.

In chemical plants gas from a central plant is often used for both power and industrial heating.

SIZES OF HAND OPERATED PRODUCERS

Outside Dia	B T U Rating	Normal H P
12	150,000 per hr	15
18	250,000 "	25
54	500,000 "	50
60	750,000 "	75
66	1,000,000 "	100
72	1,250,000 "	125
78	1,500,000 "	150
90	2,000,000 "	200
105	3,000,000 "	300

GUARANTEES

Smith Gas Plants are guaranteed to deliver in gas 70 to 75 per cent of the heating value of the fuel burned. When operated at rated load the gas value is guaranteed to be not less than 130 to 140 B.T.U. per cu. ft., depending on the kind of fuel used.

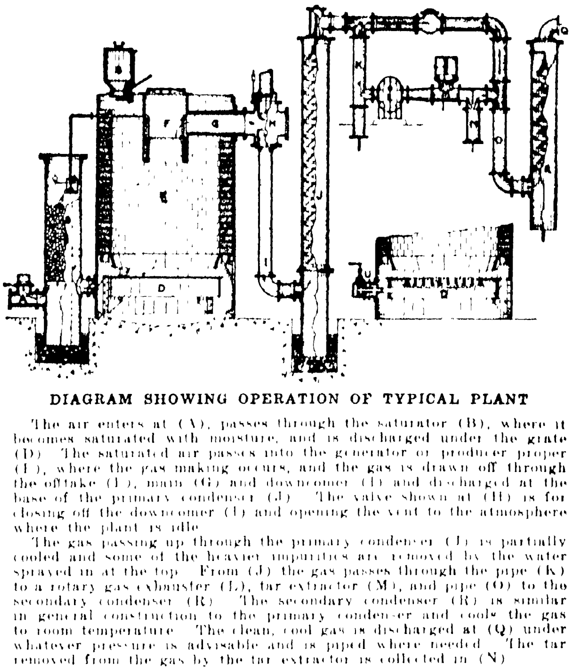


DIAGRAM SHOWING OPERATION OF TYPICAL PLANT

The air enters at (A), passes through the saturator (B), where it becomes saturated with moisture, and is discharged under the grate (D). The saturated air passes into the generator or producer proper (E), where the gas making occurs, and the gas is drawn off through the offtake (F), main (G) and downcomer (I) and discharged at the base of the primary condenser (J). The valve shown at (H) is for closing off the downcomer (I) and opening the vent to the atmosphere where the plant is idle.

The gas passing up through the primary condenser (J) is partially cooled and some of the heavier impurities are removed by the water sprayed in at the top. From (J) the gas passes through the pipe (K) to a rotary gas exhauster (L), tar extractor (M), and pipe (O) to the secondary condenser (R). The secondary condenser (R) is similar in general construction to the primary condenser and cools the gas to room temperature. The clean, cool gas is discharged at (Q) under whatever pressure is advisable and is piped where needed. The tar removed from the gas by the tar extractor is collected in (N).

A LIST OF TYPICAL INSTALLATIONS OF SMITH PRODUCERS

Name of Plant	Address	Fuel Used	Gas Used for	Capacity	Number of Repeat Orders
E I DuPont De Nemours & Co.	Wilmington, Del.	Penna Bituminous	Heating in Chemical Processes	27,000,000 B T U per hr	1
Crucible Steel Co of Amer	Harrison, N J.	Penna Bituminous	Heavy Forging Furnaces	108,000,000 " "	
Edison Lamp Works	Harrison, N J.	Penna Bituminous	Glass Furnaces	63,000,000 " "	1
Halcomb Steel Co	Syracuse N Y	Penna Bituminous	Billet Heating, Heat Treating	80,000,000 " "	3
Aluminum Co of America	Niagara Falls, N Y.	Penna Bituminous	Reheating	10,000,000 " "	
National Carbon Co	Cleveland, Ohio	W Va Bituminous	Carbon Baking	70,000,000 " "	
Hazel Atlas Glass Co.	Washington, Pa	Penna Bituminous	Glass Furnaces	175,000,000 " "	2
J M Horton Ice Cream Co.	New York City	Penna Anthracite	Gas Power Plant	900 H P	1
[illegible] Manufacturing Co	Columbus	Bituminous	Power Heating Furnaces and Core Ovens	36,000,000 B T U per hr	
Robbins & Myers Co	Springfield, Ohio	Ohio Bituminous	Japanning Heat Treating Soldering	9,000,000 " "	1
The Dayton Engr Lab Co	Dayton, Ohio	W Va Bituminous	Heat Treating Annealing Carburizing	12,000,000 " "	
The Ford Motor Co	Detroit, Mich	Bituminous	Power Heating Furnaces Japanning	325,000,000 " "	8
The San Antonio Portland Cement Co	San Antonio, Tex	Tex Lignite	Gas Power Plant	1,600 H P	2
Dakota Light & Power Co	St Paul, Minn	Anthracite	Gas Power Central Stations	650 "	2
Kellogg Toasted Corn Flake Co	Battle Creek, Mich	Anthracite	Baking Cereal Food Products	24,000,000 B T U per hr	2
Organic Salt & Acid Co	Newark, N J.	Anthracite	Heating in Chemical Processes	4,000,000 " "	
U S Cast Iron Pipe & Foundry Co	Bessemer, Ala	Ala Bituminous	Mold Drying and Core Baking	22,000,000 " "	
The Nonotuck Silk Co.	Leeds, Mass.	Pa Anthracite	Industrial Power Plant	600 H P	1

SMITH & SERRELL

General Sales Agents
12 CENTRAL AVE., NEWARK, N. J.
DISTRICT OFFICES CLEVELAND 461 CENTURY BLDG PITTSBURGH, 633 FULTON BLDG

PRODUCTS

"Francke" Flexible Couplings, for Direct Shaft Drives.

Heavy Pattern Type
Double, Floating Ring Type
Marine Type
Small Power, Light Duty Type
Magneto Type

"Pintite" Rigid Couplings, for Line Shafting.

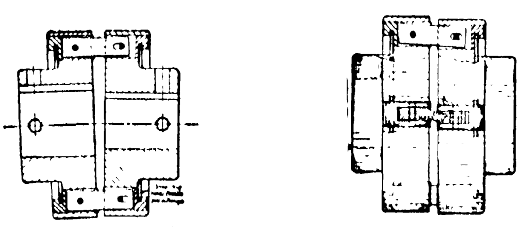
HEAVY PATTERN TYPE FRANCKE FLEXIBLE COUPLINGS

Simply two flanges, of cast iron or steel, connected by a series of flexible laminated steel pin units instead of by rigid bolts, giving three-direction flexibility.

"FRANCKE" HEAVY PATTERN TYPE FLEXIBLE COUPLING

DETAIL OF FLEXIBLE PIN UNIT

Each flexible pin unit is extensible, can pivot on the keeper cross pins and, being laminated, can bend between the keeper supports. As the individual pin units are flexible in three directions, so each coupling when assembled is also flexible in three directions.



When the shafts are out of line the pin springs slide in the keepers, allowing each shaft to run on its own center

When the shafts are off center, part of the flexible pins pivot about the cross pins (as shown at top and bottom) In a few of the other pin units a slight bend of the springs allows for the misalignment

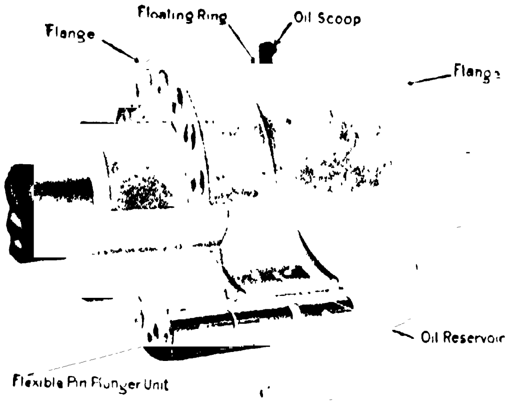
DETAILS OF CONSTRUCTION AND MOVEMENT

Francke Flexible Couplings provide against excessive bearing friction due to the usual errors in setting up and the usual misalignment of operation. They also provide a cushion for the driving shocks, reduce vibration, and so make possible the successful operation of direct-connected machines.

Uses—The Heavy Pattern type is generally used for connecting the shaft of a prime mover to the shaft of a driven machine where there are two bearings on each shaft—four bearings in a row.

DOUBLE, FLOATING RING TYPE FRANCKE FLEXIBLE COUPLINGS

This consists of two fixed flanges (one on shaft) between which is interposed a floating



"FRANCKE" DOUBLE, FLOATING RING TYPE FLEXIBLE COUPLING

which is connected to both flanges by a series of flexible steel pin plunger units. These pins support or "float" the ring. When the shafts are off center, the floating ring tilts in the direction of the misalignment, providing exceptional ability to take care of misalignment

Uses—The Double Coupling is intended primarily for large power, comparatively slow speed, and heavy shocks, with excessive misalignment to be anticipated

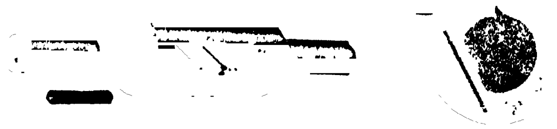
QUOTATION AND ORDER DATA

On all inquiries and orders for Francke Flexible Couplings, the following essential data should be supplied:

1—Number required
2—Horse power (normal and maximum)
3—Revolutions per minute
4—Diameter of both bores
5—Size of both keyways
6—Kinds of machines connected (both driver and driven)

PINTITE RIGID COUPLINGS

The cast iron sleeve is bored for a sliding fit on the shafts. The pin holes are drilled in pairs at an angle Each pin has a hardened cupped cutting end. With the sleeve in place on the shafts, the pins are driven home with a hammer, cutting their own cross keyways in the shafts. The act of driving the pins gives a "keyed and wedged" grip locking both shafts and pins in place.



PINTITE RIGID LINE SHAFT COUPLING

Pintite Couplings are carried in stock by many mill supply houses in standard line shaft sizes. They can also be furnished for any shaft size and in reduction patterns.

CATALOG

Separate bulletins describing various types of couplings for specific purposes will be sent on request stating the service conditions to be met.

SNYDERFIBA CORPORATION

Lessors of Patent Paper Drum and Barrel Making Machines

15 CLINTON STREET, NEWARK, N. J.

PRODUCTS

Machines for the manufacture, at your own plant, of Snyderfiba Patent Paper Barrels and Drums.

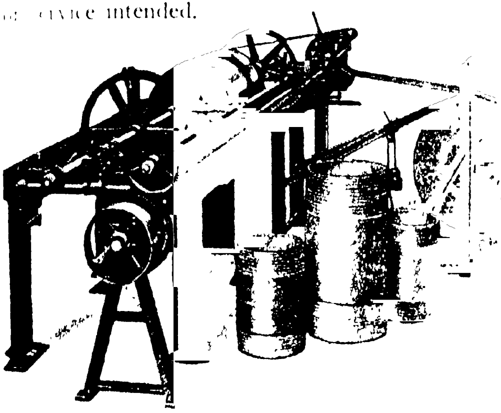
SNYDER PAPER BARREL MAKING MACHINE

This machine makes drums and barrels from 10" to [illegible] in diameter and any length to 32".

One mandrel, of whatever size desired, is furnished with the machine, others may be purchased from us at [illegible]

Standard diameters are: 10½", 12", 14", 15", 16", 17[illegible]", 19⅛", and 20".

Packages can be made heavy or light— to suit load or service intended.



PAPER DRUM AND BARREL MAKING MACHINE

5 H P required with simple overhead double clutch and brake arrangement. Actual floor space occupied by machine—9' x 19'.

The strength is determined by width of paper used; by the number of laminations, and by the pitch at which the spiral is wound.

The operation of the machine does not require a skilled mechanic.

The production of the machine is 350 to 500 packages per day, depending on the size.

BARREL HEADINGS

The packages can be headed with either a regular wooden head with inside and outside steel hoop arrangement, or with a solid crimped on steel head When using pressed steel heads two men will operate the machine and put one end in the barrels If other heading is used four men will be needed for maximum production

ADVANTAGES

Snyderfiba packages are clean, always the same cubic capacity and weight, they require no inside paper bag lining, and are accepted by the Interstate Commerce Commission for shipment of Insecticides without a paper lining, they are sift proof, there is no shrinkage and in consequence do not need recoopering when your products are stored in them, in your warehouse. Your storage space for cooperage can be greatly reduced, as your raw materials consist of chip board paper, in rolls, silicate of soda, which is the adhesive; and heading

If you are now making your own wooden cooperage, your insurance risk will be very much less, and your investment in cooperage accordingly smaller

FIBER CONTAINERS SUPPLIED BY OUR MANUFACTURERS

The function of this Corporation is merely the leasing of machines on which these containers can be made, and to a manufacturer whose requirements are not in excess of a hundred barrels per day, we will be very glad indeed to recommend our various commercial manufacturers in different parts of the country, who will be pleased to quote

OUR CONTAINERS ARE SUCCESSFULLY USED FOR SHIPPING

Insecticides
Dry Colors
Aniline Dyes
Drugs
Food Products
Glassware
Dry Tanning Extracts
Coffee and Spices
Chemicals
Stoneware valves and fittings
Dried Fruits

GROUP OF SNYDERFIBA CONTAINERS

SOWERS MANUFACTURING COMPANY

Dopp Seamless Apparatus

1299 NIAGARA STREET, BUFFALO, N. Y.

PRODUCTS

"Dopp" Cast Iron Seamless Jacketed Apparatus, consisting of Steam and Oil Jacketed Kettles, Mixers, Vacuum Pans, Pressure Pans, Autoclaves, etc. "Dopp" Seamless Jacketed Soap Crutchers. Single Shell Kettles with or without agitators. Apparatus of Special Design.

USES

Partial List of Industries Using **Dopp** Equipment.

- Artificial Leather
- Artificial Silk
- Batteries
- Belt Dressing
- Canning
- Carbon Paper
- Celluloid Products
- Cements
- Chemicals
- Chocolate
- Cleaning Compounds
- Cocoa
- Cold Creams
- Drugs
- Dyestuffs
- Explosives
- Food Products
- Glass Manufacturers
- Glues and Pastes
- Graphite
- Grinding Wheels
- Gum, Chewing
- Ink
- Insecticides
- Insulated Products
- Laboratories
- Licorice
- Linoleum
- Margarine
- Matches
- Meat Extracts
- Oils and Lubricants
- Ointments and Salves
- Optical Goods
- Packing Houses
- Paper, Coated
- Pencils and Crayons
- Phosphorus and Sulphur
- Polishing Compounds
- Polish, Shoe, Stove, etc
- Rubber Cements
- Sand Paper
- Salt
- Soaps
- Textile
- Tobacco
- Tooth Paste
- Varnish
- Wall Board
- Wax

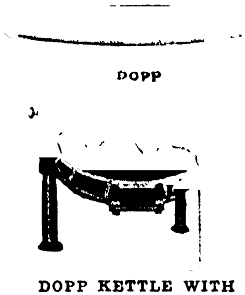
ADVANTAGES OF SEAMLESS, ONE-PIECE, LEAKLESS KETTLES

Completely illustrated and described in Catalog No. 6.

Cast in one piece—Kettle, jacket, staybolts (outlet also when specified), are all in one piece; not put together, but cast complete, all at one time from one ladle of iron.

Thin shells insure quick heating.

Unusual Strength—Dopp Seamless jacketed apparatus is of unusual strength, due to the staybolts being cast right in the kettle. They not only reinforce the shell, but facilitate the circulation of the steam in the jacket, and hasten the transmission of the heat to the contents.

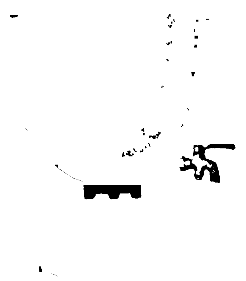


DOPP KETTLE WITH PIPE LEGS

Smooth castings—Dopp Seamless Kettles are cast by a special process in which the iron does not come in contact with sand at all. This produces an absolutely smooth surface without the necessity of grinding the inner surface, which operation destroys the wearing qualities of a kettle.

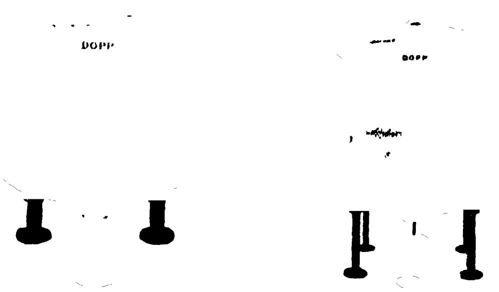
Long lasting, because of the simplest possible construction. No bolts or rivets to work loose from contraction and expansion of the metal. Dopp Kettles never leak, last indefinitely and give constant satisfaction.

Safety is an important factor in steam jacketed equipment. The absolute safety of Dopp Seamless Kettles lies in their design, the method of manufacture and the 35,000 pounds tensile strength iron used. Every Standard Kettle is tested to 150 pounds hydrostatic pressure Special kettles built for higher pressures.



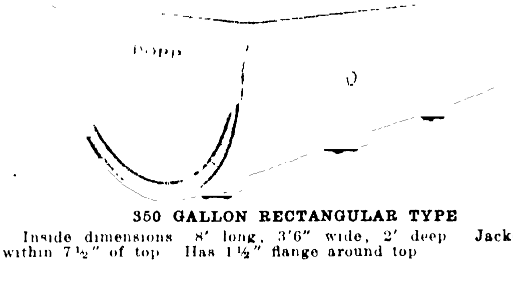
DOPP KETTLE WITH BRASS FAUCET

Guarantee—Covers all defects due to workmanship or material and is not for one year or for five years but for life



Full Jacket Half Jacket

FLAT BOTTOM TYPES



350 GALLON RECTANGULAR TYPE

Inside dimensions 8′ long, 3′6″ wide, 2′ deep **Jacket** comes within 7½″ of top Has 1½″ flange around top

GENERAL

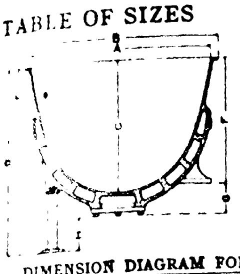
Sizes—All standard sizes with principal dimensions are listed in table on opposite page. However, we can build modifications of any of these shapes and sizes when requirements necessitate it.

Legs—Table under column headed "H," gives clearance between bottom of kettle and floor for all kettles with which standard legs are included in price. Special legs giving any desired clearance can be furnished at extra cost for these as well as all other sizes.

Outlet for contents—These can be furnished in either the screwed in or cast through type, and in whatever size and style necessary to suit product.

Continued on Next Page

TABLE OF SIZES



"A" Inside Diameter
"B" Outside Diameter
"C" Inside Depth
"D" Over-all Height Mounted on Legs
"E" Distance Top of Jacket to Rim
"F" Distance Rim to Bottom of Lug
"G" Distance Bottom of Leg to Outside Bottom of Kettle
"H" Distance Bottom of Kettle to Floor
"I" Heating surface in sq ft
"P" Designates Pipe Legs

DIMENSION DIAGRAM FOR USE WITH FOLLOWING TABLE

Ga.	TYPE	A	B	C	D	E	F	G	H	I
1	Std Flat Bottom	7 5/8"	8 3/8"	6 7/8"	10 1/8"				1 1/2"	3
4	" "	12 1/8"	15 1/2"	8 1/4"	19 3/4"				8"	7
5	Round Bottom	16 7/8"	20 1/4"	8 5/8"	19 7/8"	4 3/8"			7 3/4"	1.7
5	Spec " " Full Jacket	11"	19"	14 1/2"	20 1/2"	1"			12"	3.66
5	" Flat bottom Full Jacket	11"	19"	13"	28 1/2"	1"			12"	3.81
10	Std Round Bottom	18 1/8"	21 1/2"	13 1/2"	25 1/8"	9 1/4"			7 3/4"	1.7
10	" Flat Bottom	16 3/4"	20 1/8"	11 7/8"	22 3/8"				7"	1.5
15	" Round "	18"	21 3/8"	20"	32 1/8"	14 3/8"			7 3/4"	1.7
15	Spec Flat Bottom Full Jacket	18"	26 1/2"	16"	28 1/4"	1"			8"	8.0
20	Std Round Bottom	30"	34 1/4"	12 3/4"	22"	4 7/8"			5 1/2"	4.95
30	" " "	30 3/4"	35"	17"	27"	6 7/8"			6"	6.15
40	" " "	31 7/8"	36 1/8"	19 5/8"	28 5/8"	7 1/2"			5"	7.6
40	" " " Hotel	26"	30"	23 1/2"	40"	14 1/2"			12 1/4" (P)	5.07
50	" " "	32 7/8"	37 1/8"	22 3/8"	32 5/8"	9"			5 3/4"	8.4
55	" " " Hotel	29"	33"	26"	40"	16"			10" (P)	6.25
65	" " "	39 1/8"	43 3/8"	18 1/2"	31"	8 1/4"			8 1/4"	9.3
70	" " " Hotel	33"	37"	26"	40"	14 1/2"			9 1/2" (P)	8.72
80	" " "	40 3/4"	45"	23 1/4"	34 1/4"	9 3/4"			6 3/4"	12.2
85	" " " Hotel	37 1/2"	41 1/2"	26"	40"	13"			10" (P)	11.1
100	" " "	41 1/2"	46 1/4"	25 7/8"	36 7/8"	10 1/4"			6 3/4"	12.7
110	" " " Hotel	37 1/2"	41 1/2"	31"	45"	15 1/2"			9 3/4" (P)	12.7
125	" " "	47 1/4"	52 1/4"	26 1/4"	38 1/4"	11 1/2"			6 3/4"	14.7
125	Spec " " High Jacket	41 1/4"	46 1/4"	28 1/4"		8"	22 3/4"	12"		19.6
125	" " Bottom Full Jacket	41 1/4"	50 1/4"	28 1/4"		1"	22 3/4"	12"		26.1
125	" Flat Bottom Full Jacket	37 3/4"	45 1/4"	28"		1"			(P)	29.5
135	1000 lb Crutcher Kettle	38 1/2"	43 1/2"	36"		26 3/4"	30"	11"		8.1
150	Std Round Bottom.	47 1/2"	53 1/2"	30 3/8"		12"	25 1/2"	9 1/4"		16.4
150	Spec. Round Bottom High Jacket	41 5/8"	47"	33"		14"	26"	13 3/4"		19.6
150	Spec Round Bottom Extra High Jacket	41 5/8"	47"	33"		5"	26"	13 3/4"		26.1
175	Std Round Bottom	53 1/2"	59 1/4"	27 3/4"		9"	25 1/2"	7 1/2"		21.2
175	1500 lb Crutcher Kettle	41 5/8"	47"	39 1/2"		26 3/4"	30"	15"		11.2
200	Std Round Bottom	53 1/2"	59 1/4"	29 3/4"		9"	23 1/4"	12"		24.1
200	Spec Flat Bottom 1/2 Jacket	40 1/2"	46"	40 1/2"		21"			(P)	25.8
200	Spec Round Bottom Full Jacket	45"	54 1/4"	40 1/2"		1"	23"	24 3/4"		31.7
225	1800 lb Crutcher Kettle	41 3/4"	47"	46"		33"	30"	21 1/2"		11.2
250	Std Round Bottom	60"	65 1/2"	31"		10 3/4"	22"	14"		34.6
300	" " "	62 1/2"	68"	34 5/8"		12"	25 1/2"	13 1/4"		34.1
300	Spec Round Bottom High Jacket	47 3/4"	53 1/4"	53 1/2"		8"	36"	24 1/2"		38.3
300	Round Bottom Full Jacket	47 3/4"	57 1/2"	53 1/2"		1"	36"	24 1/2"		45.3
350	2000 lb. Crutcher Kettle	51 3/4"	57"	49 3/8"		29 5/8"	30"	25"		27.0
350	Std Round Bottom	62 1/2"	68"	38 5/8"		12 3/4"	29 1/2"	14"		31.8
400	" " "	67 1/2"	72 1/2"	43 1/2"		17 1/2"	35"	13 1/2"		35.6
450	3600 lb Crutcher Kettle	51 3/4"	57"	59 3/8"		39 5/8"	40"	25"		27.0
500	Std Round Bottom	66 3/4"	73 1/4"	51 1/4"		23 3/4"	33 1/2"	23 3/4"		43.0
500	Spec Round Bottom High Jacket	66 3/4"	73 1/4"	51 1/4"		15"	33 1/2"	23 3/4"		55.0
500	Spec Round Bottom Full Jacket	66 3/4"	78 1/4"	51 1/4"		1"	33 1/2"	23 3/4"		76.4
550	4500 lb Crutcher Kettle	51 3/4"	57"	69 3/8"		49 5/8"	50"	25"		27.0
650	Std Round Bottom	68"	74 1/2"	61"		33 1/2"	43 1/2"	23 1/2"		43.0
650	Spec. Round Bottom High Jacket	68"	74 1/2"	61"		24 3/4"	43 1/2"	23 1/2"		55.0
650	Spec Round Bottom Extra High Jacket	68"	74 1/2"	61"		11"	43 1/2"	23 1/2"		76.4
650	Spec. Round Bottom Full Jacket	68"	79 1/2"	61"		1"	43 1/2"	23 1/2"		90.7
700	Spec Round Bottom	60"	66 1/2"	68"		17"	30"	44"		62.2
800	Std. Round Bottom	69 1/4"	75 3/4"	71"		43 1/2"	53 1/2"	23 1/2"		43.0
800	Spec. Round Bottom High Jacket	69 1/4"	75 3/4"	71"		34 3/4"	53 1/2"	23 1/2"		55.0
800	Spec. Round Bottom Spec High Jacket	69 1/4"	75 3/4"	71"		21"	53 1/2"	23 1/2"		76.4
800	Spec Round Bottom Extra High Jacket	69 1/4"	75 3/4"	71"		11"	53 1/2"	23 1/2"		90.7

SINGLE SHELL APPARATUS

While we specialize in jacketed apparatus, any of the above kettles can be furnished without the jacket. These single shell kettles can be equipped with any of our various styles of agitators.

AGITATORS

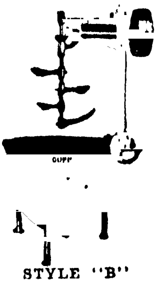
STYLE "A" BRACKET TYPE

Style "A" Bracket Type Agitator—For rapid and thorough mixing of semi-fluid substances. Agitator consists of a series of propeller blades so fitted together as to form a continuous screw. This screw forms a conveyor which draws the material from the bottom of the kettle up through and over the drum. The material in contact with the jacketed surface is therefore constantly changed.

Sizes: 20 to 100 gallons in Bracket Type as illustrated 20 to 800 gallons in bridge type drive

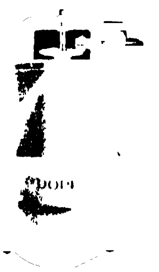
Style "B" Bracket Type Agitator—Built with either bracket or bridge type drive in all sizes from 20 to 100 gallon inclusive. All larger sizes, bridge type drive only.

This mixer is well adapted for use with all substances where it is desired to assist evaporation, or where a simple agitation of the materials will prevent their sticking to the sides of the kettle



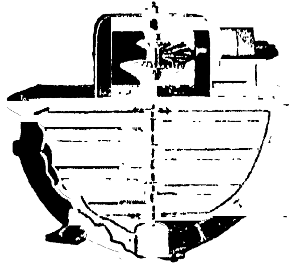
STYLE "B" BRACKET TYPE

Style "B" Bridge Type Agitator—This combination of kettle fitted with steel belt was designed to handle materials where but a relatively small jacketed surface is required. The kettle proper is of our seamless construction, thus doing away with all chance of leaks. Any of our kettles or agitators can be fitted with these steel belts.



STYLE "B" WITH STEEL BELT

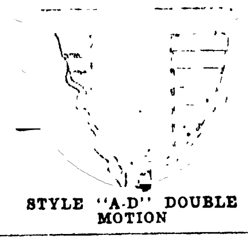
Style "D" Bridge Type Agitator—Designed for thorough agitation of the heavier grades of materials. The outside sweep with its cross paddles revolves in one direction, while the smaller paddles revolve in the opposite direction at twice the speed. Adjustable steel scrapers are attached to the sweep, scraping the interior surface of the kettle.



STYLE "D" DOUBLE MOTION

Sizes · 20 to 800 gallons in bridge type as illustrated. Also built with bracket type drive, sizes 20 to 100 gallons inclusive.

Style "A-D" Agitator—Develops a most thorough agitation as two radically different motions are obtained. The spiral screw lifts the contents to the top of the mixer while the sweep with paddles attached works through the mass in the opposite direction forcing it downward so that it is again caught by the screw. The outside sweep is provided with adjustable steel scrapers which scrape the interior surface of the kettle. Made in all sizes from 20 gallons up.



STYLE "A-D" DOUBLE MOTION

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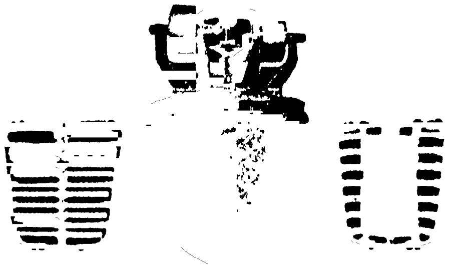


ROUND BOTTOM FULL JACKET KETTLE WITH "D" AND "AD" MIXERS

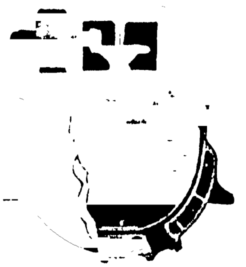
Both mixers as illustrated are built entirely of cast iron

Style "I" Agitator—This mixer exerts a plow-like action on contents of kettle. Paddles are staggered so that those on one side strike the material which passes between the paddles on the other side.

Covers—As shown by this illustration and one immediately above, all Dopp Kettles may be equipped with covers for either vacuum or pressure.

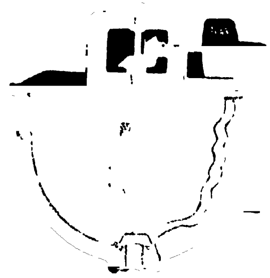
STYLE "I" WITH COVER

Style "J" Agitator—Made in all sizes from 20 gallons up. Sweep built same as sweep part of "D" mixer. Used where simple agitation only is required but where it is necessary to keep contents scraped from jacketed surface to prevent sticking and burning.



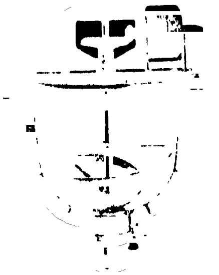
STYLE "J"

Style "K" Propeller Screw Agitator—The propeller forces the contents up through the drum where the swirl is broken by means of stationary vanes. Clearance between bottom of drum and kettle is adjustable. This agitator is particularly adapted for the rapid and thorough mixing of light liquids such as emulsions.



STYLE "K"

Style "L" Ribbon Type Agitator—The ribbon follows the contour of the kettle to whatever height desired, the action being to raise the contents and dump toward the center of the kettle. It is very efficient in mixing granular or crystalline substances as well as the mixing of such materials with liquids.



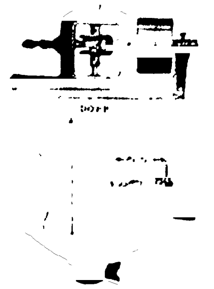
STYLE "L"

Sizes · 20 to 800 Gallons capacity

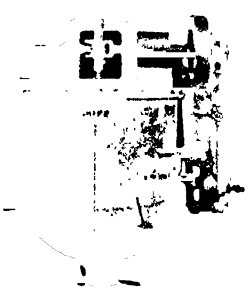
OIL JACKETED APPARATUS

The seamless feature, obviating oil leaks—the thin, yet safe walls, and the staybolt construction, which materially assists circulation, make the Dopp kettle most efficient for use in connection with oil heating systems. Temperatures up to 550°F. can be reached and maintained inside the kettle. Details furnished upon request.

"DOPP" SOAP CRUTCHERS



"A" BELT DRIVEN



"B" ENGINE DRIVEN

(All Dimensions in Inches)

Capacity, Lbs.		Diam. at Top	Depth Inside	Height			T & L Pulleys (With Style "A" only)	Floor Space
				Over All		Lug to Flange		
Rated	Total			A	B			
1000	1200	38	36	65	77	30	14 x 4	48 x 54
1500	1700	42	40	69	81	30	14 x 4	60 x 72
1800	2040	42	46	75	87	30	14 x 4	60 x 72
2600	3100	52	49	79	89	30	20 x 5	72 x 84
3000	4000	52	59	89	99	40	20 x 5	72 x 84
4500	5000	52	69	99	109	50	20 x 5	72 x 84

We illustrate above our improved types of crutchers which are used extensively in the soap making industry. Kettles are of **seamless** construction, as described on page 840. This eliminates all possibility of leaks and as the inside of the kettle is perfectly smooth, it can be quickly and easily cleaned after each operation. Agitator is of the conveyor screw type surrounded by pipe radiator or jacketed drum. Style "A" is provided with tight and loose pulleys, as illustrated. Style "B" is provided with an 8-horsepower engine, making it ideal for either small plants where engine can be used to drive other machinery or large plants where it is easier to run piping than shafting.

QUOTATION INFORMATION

In order to save time in making quotations, we suggest that in writing us for prices you give particular attention to the following:

1—What is the maximum steam pressure you will use?

2—If kettle is to be equipped with cover, what will be the maximum internal pressure.

3—What size and style outlet do you desire in bottom of kettle for contents?

4—Should this outlet be in center of kettle or to one side of bottom?

5—If kettle is to be equipped with legs for support, what clearance is desired between kettle or outlet (if required) and floor?

6—What is the consistency of the material to be handled? (Water, oil, molasses, tar, etc.)

ADOPT THE DOPP

Continued on Next Page

DOPP VACUUM PANS

asis of these pans is the Dopp Seamless Steam d Kettle used for the lower half. The dome ractically the same shape as the kettle, makes symmetrical and well proportioned piece of ap- . These pans are cast by the same special fully described on page 840) which has made Kettles so famous for their smoothness and th. This, combined with their leakless feature, them particularly well adapted for use where eaning and absolute dryness are essential. Are used in making beef extract, prepared foods many kinds of chemical products.

Capacity given is that which entire pan will hold which should be particularly noted when figuring capacities wanted. They are listed in this way on account of the different actions of the various materials produced in them. Some, for example, do not foam and pan can be at least two-thirds filled. Others foam violently and pan cannot be over half full. On this account it would not be possible to list these in working capacities.

Standard Sizes—10, 40, 60, 100, 200, 300, 350, 400, 500, 600, 700, 800, 1000, 1300 and 1600 gallons. The kettles making up the bottom halves of these sizes are the standard kettles of one-half the above capacities, dimensions of which are given in table on page 841.

Standard Pans are equipped with man-hole, two peep-holes, vapor outlet and bosses tapped for thermometer, vacuum gauge and vacuum breaker. All other attachments, such as thermometer, vacuum gauge, save-all, condenser, pump, etc., furnished only when specified.

Manholes—Standard sizes furnished as follows: 10 gallon, 4″ hand hole; 40, 60 and 100 gallon, 9″ x 12″; 200, 300 and 350 gallon, 12″ x 15″; 400 gallon and all larger sizes, 14″ x 18″.

Peep-holes—Standard sizes furnished as follows: 10 gallon, 2″; 40 and 60 gallon, 4″; 100, 160 and 200 gallon, 5″; all larger sizes, 6″.

Vapor Outlet—On standard pans, unless otherwise specified, is placed in center top of dome and fitted with companion flange of the following sizes. 10 gallon, 2″; 40 and 60 gallon, 2½″; 100 and 160 gallon, 3″, 200 and 300 gallon, 4″; 350 and 400 gallon, 5″, 500 gallon, 6″; 600 gallon, 7″; 700 gallon, 8″; 800 gallon, 9″, 1000 gallon, 10″; 1300 and 1600 gallon, 12″.

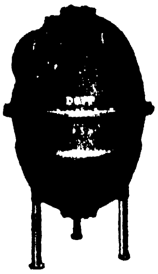
Outlet for Contents—These can be furnished in either the screwed in or cast through type, and in whatever size or style necessary to suit product.

Legs—On sizes up to 100 gallons inclusive (see illustration top of next column) are those furnished with the standard kettles which are used to make up these sizes as listed on page 841. Special legs for these sizes as well as legs for all larger sizes can be supplied when desired.

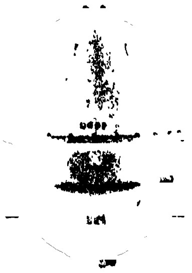
Mixers—These vacuum pans can be equipped with any of the various styles of agitators made by us, a few of which are illustrated and described on the preceding pages.

Save-all, Condenser and Pump—When this equipment is desired we will gladly furnish estimates upon receipt of complete data covering customers' requirements.

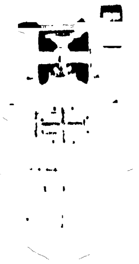
STANDARD DOPP VACUUM PANS



ALL SIZES UP TO AND INCLUDING 100 GAL



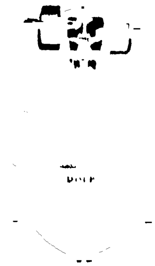
ALL SIZES OVER 100 GAL



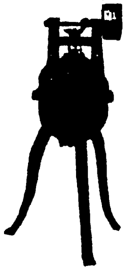
VACUUM PAN WITH SINGLE MOTION AGITATOR

Standard Pan with Drive for Any Type of Single Motion Agitator—For view of opposite side, showing vapor outlet, see illustration below. For detailed information as to standard sizes, etc., see preceding column.

Standard Pan with Drive for Any Type of Double Motion Agitator—For view of opposite side showing manhole, thermometer, vacuum gauge and vacuum breaker bosses, see illustration above. For detailed information as to standard sizes, etc., see preceding column.



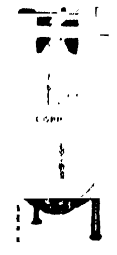
VACUUM PAN WITH DOUBLE MOTION AGITATOR



10-GAL. LABORATORY PAN

This pan is very popular for use in connection with experimental work. While having only ten gallons total capacity, it embodies all of the features of our larger equipment and therefore results obtained in this unit can be duplicated later on a manufacturing basis in our larger units.

Standard Pan with Style "K" Propeller Screw Agitator—This is the same type of agitator as described on page 842. Is built as illustrated, either for heating and mixing under vacuum or where the nature of the materials makes it necessary to have considerable space above the level of the contents.



VACUUM PAN WITH "K" AGITATOR

Special 1300 gallon Pan—Bottom half of this pan is standard 650 gallon full jacketed kettle. As the work for which this pan was designed required, at times, additional heating and cooling surface, it is fitted with two pipe coils, each working independent of the other and both independent from jacket. By this arrangement temperatures are very easily controlled. Can be furnished in any size desired.

VACUUM PAN WITH "J" AGITATOR

D. R. SPERRY & CO.

Builders of Filter Presses

BATAVIA, ILL.
(Near Chicago)

REPRESENTATIVES

NEW YORK
H. E. Jacoby, 95 Liberty St.

SAN FRANCISCO
B. M. Pilhashy, 932 Merchants Exchange Building

PRODUCTS

Filter Presses—The Sperry Filter Press. Made in 8 different sizes and of various materials.

Vacuum Pans—The Sperry Swing Kettle Vacuum Pan, also cylindrical cast iron vacuum pans up to 60" external diameter.

FILTER PRESSES

Manufacturing Facilities—The Sperry Filter Press is made entirely in our own plant This insures proper inspection and prompt shipments

Sizes—10", 12", 18", 24", 30", 32", 36", 42". Such a range of sizes will take care of all filtration problems encountered in the industries

What Made Of—The Sperry filter press can be made of the following materials—

Cast iron
Cast iron galvanized.
Cast iron enameled.
Bronze.
Lead
Aluminum.
Semi-steel
Wood, maple, cypress, yellow pine, ash treated with paraffine

There is a proper material for every substance filtered. We are always glad to furnish recommendations

Closing devices—We ordinarily furnish the Sperry quick opening and closing device by means of which a press can be opened by one or two revolutions of the capstan. We are prepared to furnish gear closing devices or ratchet closing devices as desired

Arrangements—We can supply 22 different arrangements each one of which requires a certain kind of plate For the material which you filter there is a certain arrangement which is suitable. We are able to advise fully on this

Plate surfaces—Our standard plate surface is our radial groved type This combines long cloth life with direct flow of filtrate to outlet We can furnish parallel grooved or pyramid surface if desired.

WHAT A FILTER PRESS CAN DO

A filter press separates solids from liquids It eliminates the necessity of waiting for solids in liquids to settle. It accomplishes in a few hours that which would require weeks by process of settling.

Solids are delivered in cake form and clear portion or filtrate can be piped away to suitable container

Before removing the solids from a filter press they can first be washed or lixiviated to remove some desired material held in the cake

EXPERIMENTAL LABORATORY

We have a laboratory in which experiments are carried on to determine filtering rates Our broad experience, however, enables us to figure on your requirements quite closely even without experimental data.

SPERRY HOLLOW PLATES

The Sperry hollow filter plates permit the filtration of substances at higher temperatures by means of allowing steam to enter the interior of each plate If, however, it is desired to filter at low temperatures, a refrigerating medium such as brine can be caused to circulate through the hollow interiors of the plates

FILTER CLOTHS

There are hundreds of different weaves of filter cloth, and many different materials from which filter cloths can be made We are glad to recommend the proper kind of cloth for your particular problem.

We have a filter cloth department and can supply sewed cloths or filter cloth in rolls.

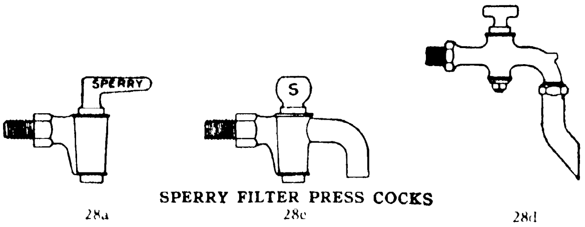
FILTER PRESS COCKS

Sperry filter press cocks are especially designed for filtration work and made in our own plant.

The No 28a cock is full opening, allowing complete and rapid draining of the plate

The No 28c cock has two outlets, one from the bibb, and the other from the plug This is used in combination with a double gutter, one outlet for clear liquor, the other for cloudy runnings. Each outlet discharges into its appropriate side of the double gutter

No. 28d accomplishes the same result except that diversion of flow from the cock is made by means of a swivel bibb.



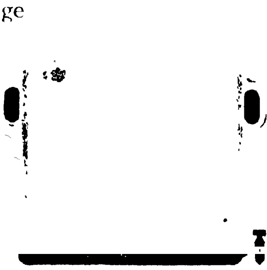
SPERRY FILTER PRESS COCKS

SPERRY FILTER PLATE

We always furnish the Sperry Radial Grooved Surface as shown below unless otherwise specified. This surface combines a large bearing for the cloth, with direct flow of filtrate to the outlet This means longer lived cloths and more efficient filtration

Other plate surfaces can be supplied when wanted

Sperry Filter Plates are made very heavy and will stand hard usage



SPERRY FILTER PLATE

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LABORATORY FILTER PRESS

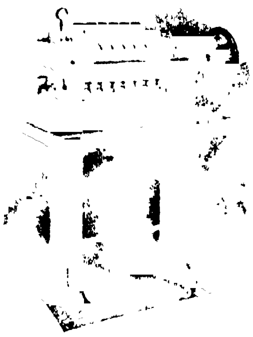
apparatus is so constructed as to be convertible various commercial arrangements used in filter It is an invaluable laboratory adjunct as the arrangement for the filtration of a given sub- can be determined It is furnished in iron, wood, or lead

outside dimensions of the plates are such that plate has a total filtering area of 1 sq ft There plates in the press giving a total filtering area of

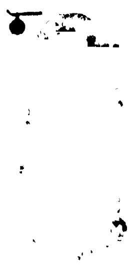
different washing systems can be used with this press

Weight about 850 lbs

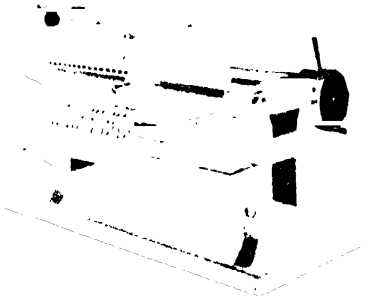
Montejus or feeding device shown at the right be employed to fill press by air pressure or a small can be used



LABORATORY FILTER PRESS

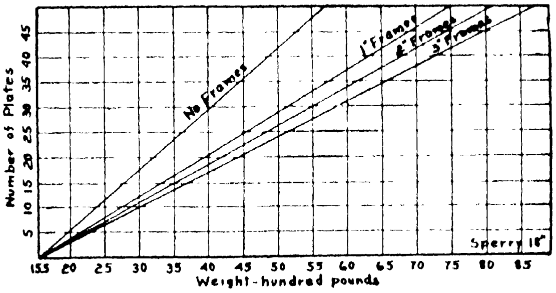


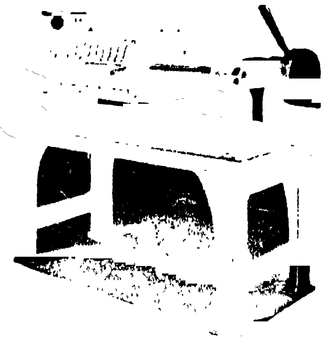
MONTEJUS

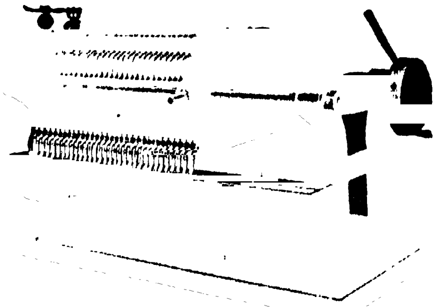


18" SPERRY FILTER PRESS DATA

Number of Plates	Filtering Area Sq Ft	Volumetric Capacity, Cubic Feet Thickness of Frames Inches 1¼" or recessed	1½"	1¾"	2"	2½"	3"
15	55.0	2.87	3.44	4.01	4.58	5.73	6.88
20	72.5	3.78	4.54	5.3	6.05	7.56	9.06
25	89.6	4.68	5.62	6.55	7.5	9.36	11.22
30	107	5.69	6.8	7.81	8.93	11.16	13.4
35	124	6.49	7.78	9.07	10.36	12.95	15.51
40	141	7.35	8.85	10.3	11.8	14.7	17.7
45	158.5	8.3	9.95	11.6	13.25	16.6	19.9
50	176	9.21	11.0	12.9	14.7	18.4	22.1

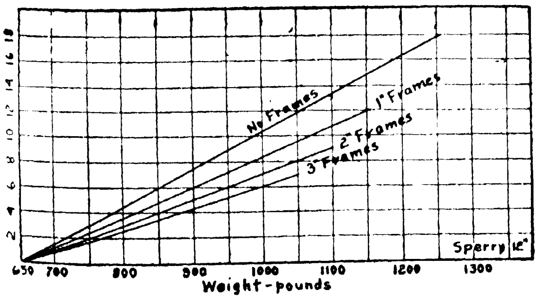






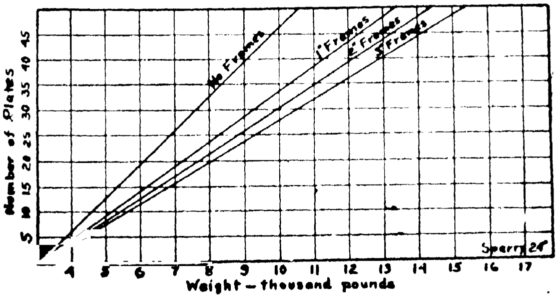
12" SPERRY FILTER PRESS DATA

Number of Plates	Filtering Area Sq Ft.	Volumetric Capacity, Cubic Feet Thickness of Frames, Inches 1¼" or recessed	1½"	1¾"	2"	2½"	3"
15	24.5	1.28	1.53	1.79	2.05	2.56	3.06
20	32.2	1.68	2.02	2.36	2.69	3.31	4.02
25	39.9	2.08	2.5	2.91	3.33	4.16	4.98
30	47.6	2.48	2.98	3.18	3.97	4.96	5.9
35	55.2	2.88	3.45	4.02	4.6	5.76	6.9
40	62.8	3.27	3.93	4.58	5.24	6.55	7.85
45	70.5	3.68	4.4	5.14	5.88	7.36	8.81
50	78.1	4.01	4.89	5.68	6.52	8.14	9.76



24" SPERRY FILTER PRESS DATA

Number of Plates	Filtering Area Sq Ft	Volumetric Capacity, Cubic Feet Thickness of Frames, Inches 1¼" or recessed	1½"	1¾"	2"	2½"	3"
15	103	5.35	6.44	7.5	8.57	10.7	12.84
20	135	7.04	8.45	9.85	11.25	14.06	16.89
25	168	8.7	10.45	12.2	13.94	17.4	20.88
30	199	10.39	12.46	14.52	16.6	20.75	24.9
35	231.5	12.05	14.19	16.88	19.3	24.1	28.95
40	264	13.75	16.5	19.25	22.0	27.5	33.0
45	296	15.4	18.5	21.6	24.7	30.8	37.0
50	328	17.1	20.5	23.9	27.4	34.2	41.0



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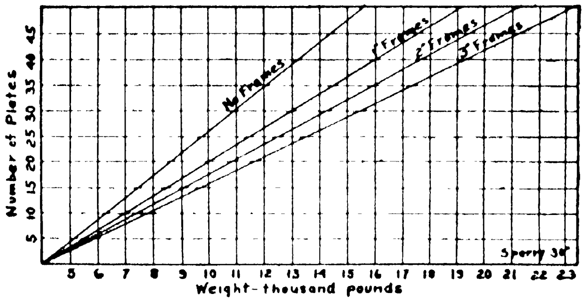
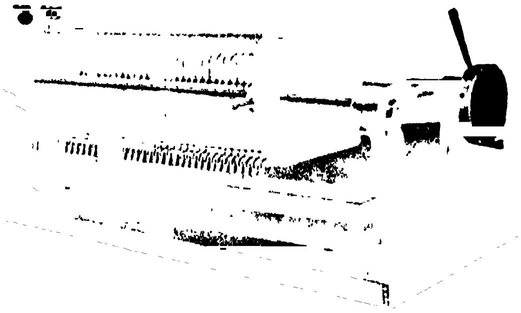
30″ SPERRY FILTER PRESS DATA

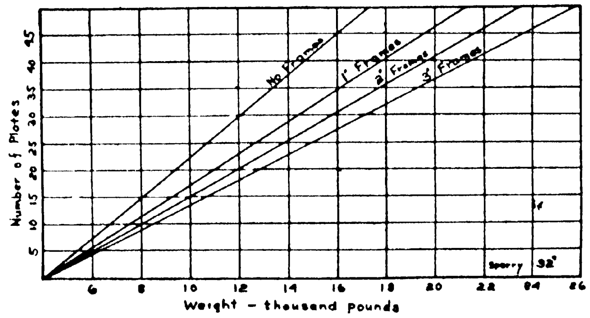
Number of Plates	Filtering Area Sq. Ft.	Volumetric Capacity, Cubic Feet Thickness of Frames, Inches 1¼″ or recessed	1½″	1¾″	2″	2½″	3″
15	168.1	8.76	10.5	12.25	14.0	17.55	21.06
20	221	11.52	13.8	16.1	18.4	23.00	27.63
25	273	14.25	17.1	19.95	22.8	28.5	34.2
30	326	17.00	20.4	23.8	27.2	34.0	40.8
35	379	19.75	23.6	27.6	31.6	39.5	47.4
40	431	22.42	26.9	31.4	36.0	45.0	53.85
45	484	25.2	30.2	35.2	40.5	50.5	60.4
50	536	27.9	33.4	39.0	44.8	56.0	67.0

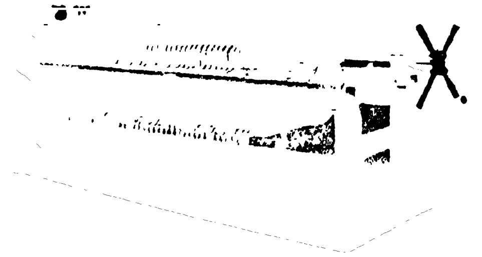




32″ SPERRY FILTER PRESS DATA

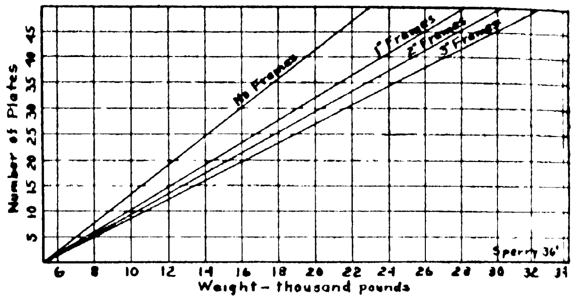
Number of Plates	Filtering Area Sq. Ft.	Volumetric Capacity, Cubic Feet Thickness of Frames, Inches 1¼″ or recessed	1½″	1¾″	2″	2½″	3″
15	193	10.0	12.1	14.1	16.1	20.3	24.2
20	254	13.2	15.9	18.5	21.2	26.5	31.8
25	314	16.4	19.6	22.9	26.2	32.6	39.3
30	375	19.5	23.4	27.4	31.2	39.0	46.8
35	435	22.7	27.2	31.7	36.2	45.5	54.3
40	495	25.8	31.0	36.1	41.2	51.5	61.8
45	556	29.0	34.8	40.6	46.4	58.1	69.6
50	616	32.1	38.5	45.0	51.4	64.2	77.1

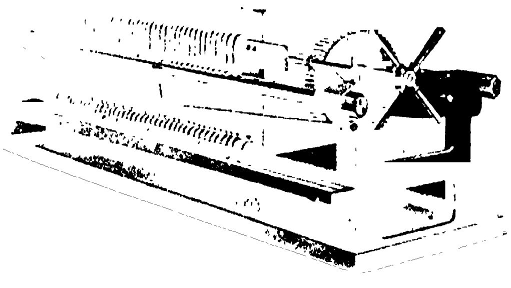




36″ SPERRY FILTER PRESS DATA

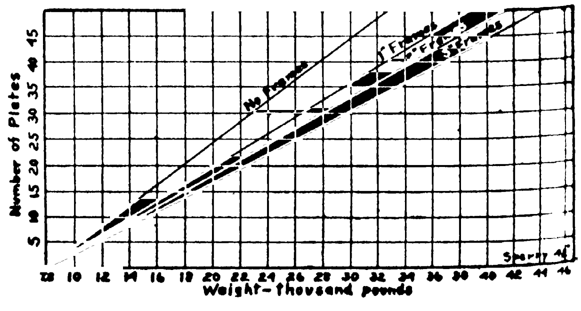
Number of Plates	Filtering Area Sq. Ft.	Volumetric Capacity, Cubic Feet Thickness of Frames, Inches 1¼″ or recessed	1½″	1¾″	2″	2½″
15	251	13.1	15.7	18.3	20.9	26.2
20	330	17.2	20.6	24.0	27.5	34.1
25	408	21.2	25.5	29.8	34.0	42.5
30	486	25.3	30.4	35.4	40.5	50.6
35	565	29.4	35.3	41.2	47.1	59.0
40	643	33.5	40.2	46.9	53.6	67.0
45	721	37.6	45.1	52.1	60.1	75.1
50	800	41.6	50.0	58.0	66.6	83.4





42″ SPERRY FILTER PRESS DATA

Number of Plates	Filtering Area Sq Ft.	Volumetric Capacity, Cubic Feet Thickness of Frames, Inches 1¼″ or recessed	1½″	1¾″	2″	2½″	3
15	347	18.05	21.7	25.3	28.9	36.1	[illegible]
20	456	23.7	28.5	33.3	38.0	47.5	57.0
25	564	29.4	35.2	41.1	47.0	58.7	[illegible]
30	682	35.5	42.6	49.7	56.8	71.0	[illegible]
35	781	40.7	48.8	57.0	65.1	81.5	98.0
40	890	46.4	55.6	65.0	74.2	92.7	111.0
45	1000	52.1	62.5	73.0	83.4	104.0	[illegible]
50	1107	57.6	69.2	80.7	92.2	115.0	[illegible]



SPRAGUE ELECTRIC WORKS

Of General Electric Company
527-531 West 34th Street
NEW YORK, N. Y.

FACTORIES
Maspeth, L I
Bloomfield, N J
New Kensington, Pa

BRANCH OFFICES
Atlanta, Citizens & Southern Bank Building
Baltimore, American Building
Boston, 84 State Street
Chicago, Fisher Building
Cincinnati, Provident Bank Building
Cleveland, Illuminating Building
Indianapolis, Traction Terminal Building
Kansas City, Dwight Building
Milwaukee, Public Service Building
Philadelphia, Witherspoon Building
Pittsburgh, Oliver Building
St Louis, Pierce Building

PACIFIC COAST REPRESENTATIVES
Los Angeles, Corporation Building
Portland, Ore, Electric Building
San Francisco, Rialto Building
Seattle, Colman Building
Spokane, Paulsen Building

PRODUCTS

The Sprague Electric Works of the General Electric Company manufactures a number of products especially adaptable to the chemical industry, a few of which are enumerated below:

VENTILATING FANS FOR CHEMICAL PLANTS

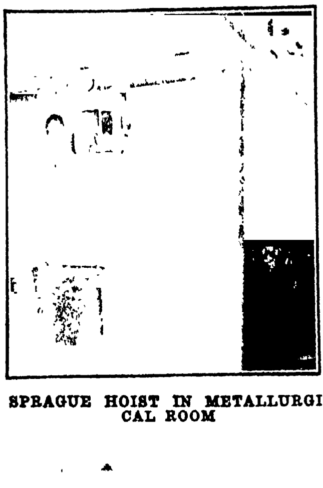
These fans are extremely useful in drawing off acid fumes common to Chemical Industry, many of which are positively dangerous to health.

Volts—A. C.—110, 220, 440, 550.
D. C.—115, 230, 550.
Sizes—12½ to 48 inches in diameter.
Capacity, 750 to 25,000 cubic feet per minute.

SPRAGUE VENTILATING FAN IN CHEMICAL LABORATORY
Sprague Ventilating Fans Made This Room Livable

MATERIALS HANDLING EQUIPMENTS FOR CHEMICAL PLANTS

Electric Hoists—For handling Ore, Coke, Molten Metal, Barrels, etc., and successfully operating under the trying conditions existing in the Chemical Industry.



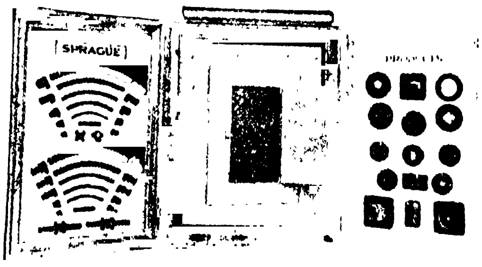
SPRAGUE HOIST IN METALLURGICAL ROOM

Type 1-6 (¼-ton) or S-1 (½- to 1-ton) hoisting speed 25 ft. per minute, height of lift 25 ft.

Other sizes up to six tons, also Monorail Cranes, Winches and Winding Drums.

TYPE S-1 HOIST

WIRING MATERIALS FOR CHEMICAL PLANTS



GENERAL EXHIBIT OF SPRAGUE WIRING MATERIALS

Flexible Steel Armored Conductors—("BX") for quick, dependable, fireproof wiring in connecting up machinery, Electric Furnaces and lights. Sizes No. 14 to No. 2. Furnished with Leaded Insulation for damp places. **Flexible Steel Conduit** in Diameters from $^5/_{16}$" to 2½".

Rigid Conduit—(Greenfieldduct)—The only Conduit Hot Galvanized inside and out—highly resistive to the elements and conditions prevalent in the Chemical Industries.

Sizes ½", ¾", 1", 1¼", 1½", 2", 2½", 3½", and 4", approximately, inside.

All sizes in 10 ft. lengths.

Spragueduct—A Superior Black Enameled Conduit. Same sizes as Greenfieldduct, also 4½", 5" and 6" diameters.

HOSE FOR VARIOUS USES IN CHEMICAL PLANTS

Flexible Steel Armored Hose—Especially adapted for severe usage, assuring longevity through the flexible Steel Armor. Indispensable where air, steam, water, or certain chemical solutions are to be conducted.

Sizes, ¼" to 2", also ½" to 1½", standard 25 and 50 ft. lengths.

SPROUT, WALDRON & COMPANY

Manufacturers of

Milling Machinery

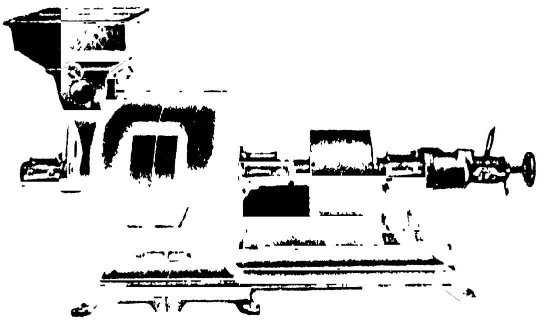
MUNCY, PA.

PRODUCTS

Roller Mills, Dust Collectors, Suction and Exhaust Fans, Attrition Mills, Burr Mills, Grinders, Crushers, Filling, Weighing and Packing Machinery, Mixing Machinery, Scales, Power Transmission Machinery.

MONARCH STANDARD BURR MILLS

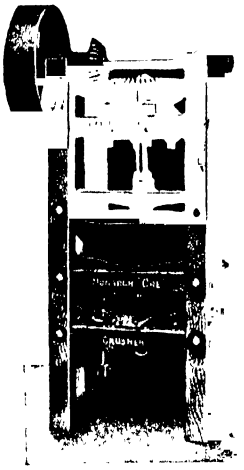
We manufacture a complete line of these efficient and widely used mills. We supply them with any drive desired and for any capacity. They are used for grinding drugs, chemicals, pigments and dry colors.



MONARCH STANDARD BURR MILL

MONARCH ORE CRUSHER

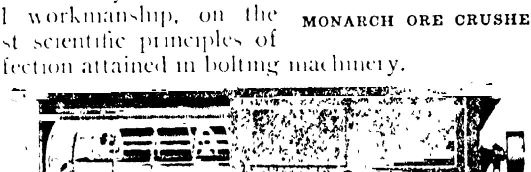
This Crusher is thoroughly built and its parts made strong for the work for which it was designed. It will crush materials of medium hardness, such as bone, oyster shells, shale, paint rock, etc., for finishing on our vertical mills.



MONARCH ORE CRUSHER

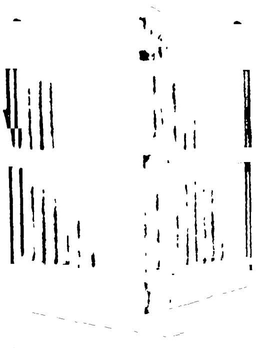
BOLTING MACHINERY

Our line of sifters, reels and bolting machinery is complete. We have a large variety of styles, adaptable to every place a sifter is required. They are constructed of the very best material and workmanship, on the most scientific principles of perfection attained in bolting machinery.



MONARCH CENTRIFUGAL REEL, STYLE "F"

WILSON TUBULAR DUST COLLECTOR



WILSON TUBULAR DUST COLLECTOR

The efficiency of a Textile Dust Collector is measured by the amount of filtering capacity of the cloth contained and the simplicity of the cleaning device.

The machine is generally attached to the ceiling but may be supported in any other suitable manner, and the general construction is simple. Dust-laden air enters the tubes in a downward course and precipitates to the lower case where a drag discharges it into a cross conveyor.

MONARCH BALL BEARING ATTRITION MILL

For pulverizing a great variety of materials, from perfectly dry materials to materials that are in suspension with a liquid.

The Monarch Ball Bearing Motor-Driven Attrition Mill embodies all of the points of excellence and superiority found in the ball bearing belt-driven mill and in addition is equipped to make it a perfect modification for the user of electric motive power.

MONARCH BALL BEARING ATTRITION MILL

The motors are the best obtainable, are specially constructed for this service and give the mill the maximum efficiency of which it is capable.

Electrical equipment consists of two Direct Connected 60-Cycle Westinghouse Special Type Induction Motors, one Oil Immersed Type "A" Auto-Starter, of sufficient size to start both motors simultaneously, one Overload Release and one No Voltage Release.

MONARCH PACKING MACHINES

We manufacture a complete line of packing and filling machines for every possible use. We also build special machines for this class.

FEEDERS AND MIXERS

A machine for every purpose.

When in need of grinding, crushing, bolting, separating and mixing machinery write to us.

THE STANDARD CALORIMETER COMPANY

Parr Calorimeters and Apparatus for Fuel Testing—Products of Acid-Resisting Alloy—Illium

EAST MOLINE, ILLINOIS

PRODUCTS

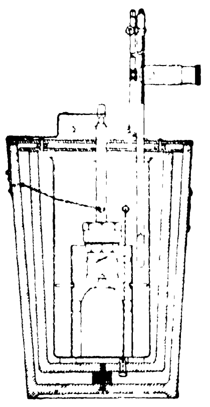
Parr Calorimeters, Illium Castings, Illium Laboratory Ware, etc. Parr Sulphur Bombs, Parr Sulphur Photometer, Parr Total Carbon Apparatus, Needle Valve for Combustion Work, Release Valve for Oxygen Bombs.

PARR STANDARD CALORIMETER

This well known type of calorimeter, in which sodium peroxide is used as the medium of combustion, has marked advantages over the old pattern bomb as follows:

1. Fusion cup removable
2. Extra cup supplied allows making of duplicate determinations.
3. Fusion cup made of special alloy most resistant of all metals to melted alkali
4. Cup comes to red heat, insuring complete combustion

Price—Calorimeter complete with thermometer, $100.00. Stirrer motor for calorimeter, $30.00. Peroxide Bomb alone, $40.00.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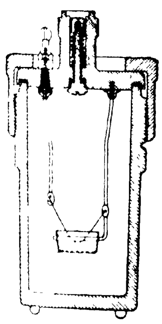
ILLIUM BOMB

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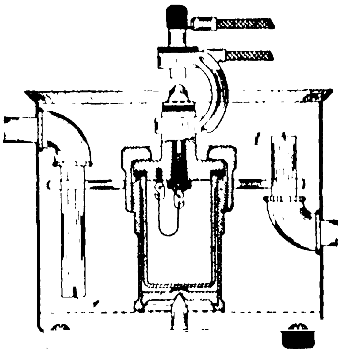
The adiabatic jacket makes it possible to maintain the temperature of the jacketing water at the same stage as that of the inner system. Thus uncertain and complicated corrections for radiation are avoided. This instrument is adapted to precise work of the most exacting degree of refinement.

Prices—Oxygen Bomb Calorimeter (plain type without thermometer), $300.00. Adiabatic type, without thermometer, $400.00. Illium Bomb (alone), $225.00. Thermometer with B. of S. certificate 65°–90°, $12.00, 65°–105°, $15.00. Stirrer Motor, $30.00.

PARR SULPHUR BOMB

For organic and inorganic sulphur and organic halogens to replace the Carius Method. Particularly recommended for use in fuel testing laboratories, research departments, rubber factories, organic laboratories, food laboratories, analytical laboratories, soil surveys.

By use of the Parr Sulphur Bomb sulphur determinations can be made in the quickest and most accurate manner. The bomb is furnished in three types. Electric ignition with water jacket, $40.00. Electric ignition without jacket, $31.50. Bomb for heat ignition, $25.00.


SULPHUR BOMB WITH WATER JACKET

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Acid is added to residue from determination of heat values, the carbon dioxide gas is measured by this apparatus and total carbon readily determined. Available hydrogen can also be determined. Price, $52.00.

NEEDLE VALVE FOR COMBUSTION WORK

By use of this valve it is possible to count bubbles passing through absorption train. Price, $5.00

RELEASE VALVE FOR OXYGEN BOMBS

Price, $5.50.

ILLIUM CASTINGS, LABORATORY WARE, ETC.

Castings of this alloy have a tensile strength of 85,000 lbs per square inch, melting-point 1280°C., Brinnell test for hardness 170 to 200 at 3000 lbs. Scleroscope hardness 27. Elongation and reduction in area, 2 to 5 per cent

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Immune to concentrated alkalies and ammonium salts.

Illium machines readily.

Illium may be obtained in form of wire and sheets.

ILLIUM LABORATORY WARE

Illium crucibles, ashing dishes, Gooch crucibles, and evaporating dishes may be obtained in all standard sizes.

Business Established 1909

THE STANDARD CARRIER COMPANY

ESTIMATING DEPARTMENT
112 East 41st Street
NEW YORK, N. Y.
FACTORY Plantsville, Conn

PRODUCTS

High grade Conveying Systems which include: Pneumatic Dispatch Tube Systems, Belt Conveyors, Wire Line Cash and Package Carriers, Cable Carriers, Tray Conveyors, Sweep-off and Pick-up Carriers, Hand Power and Push Button Light Lifts.

USES

Standard carrier systems are extensively used in offices, factories, stores and wherever materials, messages or money is handled between floors, departments or buildings.

GUARANTEE

Every endeavor has been made to fully meet the most exacting conditions to which any and all parts of the Standard systems are subjected; and they are backed by liberal guarantees, made by a responsible and financially strong company.

COOPERATIVE SERVICE

The services of the engineering department are available without charge or obligation of any kind. Address Estimating Department, 112 East 41st Street, New York.

For estimating purposes, we need a floor plan or diagram, locating the points to be served, story elevations; voltage, etc., available for power and the maximum size of number of papers or materials to be conveyed.

TYPES

We manufacture every known type of carrier service suitable for mechanical messenger work within and between buildings. This enables us to select the type of service best suited to our customer's requirements.

DESIGN

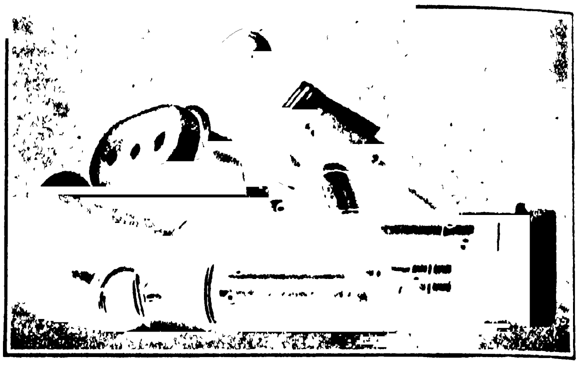
All our service has been designed and developed under the personal supervision of carrier men of many years' experience manufacturing and installing carrier systems. The result is the best possible service, easy to install and maintain, and economical in both cost and operation.

PNEUMATIC TUBE SIZES

Tube systems are gauged by the outside diameter of the transit tube. The following table shows the inside diameters and lengths of standard size tubes and message carriers.

Size		Carrier Inside Diameter	Maximum Inside Carrier Length
1 3/4"	Round	7/8"	5"
2 1/4"	"	1 5/16"	10"
3"	"	1 7/8"	12"
4"	"	2 7/8"	14"
5"	"	3 7/8"	15"
3" x 6"	Oval	1 3/4" x 4 3/4"	12"
4" x 7"	Oval	2 3/4" x 5 3/4"	14"
2 1/4"	Cash Carriers are 1 5/8" x 3 1/2" inside		"

Varying lengths of carriers can be used in the same system. Bends must be provided to fit the longest carrier used.



PNEUMATIC TUBE CARRIERS

In which messages or materials are conveyed

CARRIERS FOR SPECIAL REQUIREMENTS

Carriers may be adapted to any special requirement

One steel mill transports a 5 lb. red-hot test piece from its furnaces to the laboratory 1800 ft. away

Another plant sends eight samples in envelopes and saves over $5000.00 per month by getting test reports back promptly.

PNEUMATIC TUBE TERMINAL

A carrier dispatched through a pneumatic tube will travel any distance at the rate of 40 ft. per second.

THE STANDARD CALORIMETER COMPANY

Parr Calorimeters and Apparatus for Fuel Testing—Products of Acid-Resisting Alloy—Illium

EAST MOLINE, ILLINOIS

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1 Fusion cup removable

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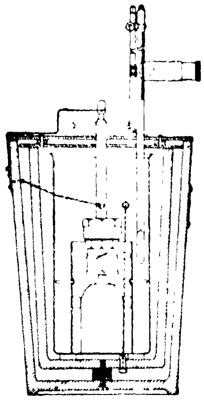

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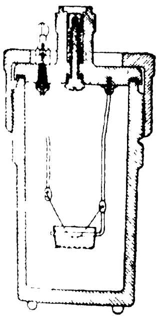

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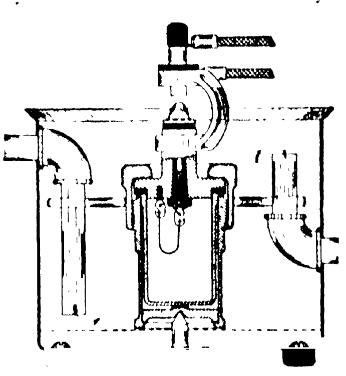

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STANDARD SCIENTIFIC COMPANY

Manufacturers and Dealers

CORNER OF 4TH AND BARROW STREETS, NEW YORK, N. Y.

PRODUCTS

Laboratory Apparatus and Chemicals.

FACILITIES

Consider our stock, manufacturing equipment and service when in the market for scientific instruments and laboratory supplies. Described in various catalogs and other publications, which will be sent to prospective purchasers.

PHYSICAL APPARATUS

Calipers, Vernier and Micrometer Screw
Clamps and Supports
Stopwatches, Seconds Pendulums and Electrical Contact Timing Devices
Vacuum and Pressure Pumps
Manometers and Gauges
Bell Jars
Barometers, Aneroid and Mercurial, including Barometer Tubes
Thermometers, Mercurial and Metallic
Radiometers
Vacuum Bottles
Meteorological Instruments, including Hygrometers, Rain Gauges, Anemometers, etc.
Acoustic Apparatus, including Tuning Forks, Resonators, and Electric Driven Forks
Small Synchronous Motors
Glass Mirrors, Prisms and Lenses
Optical Benches
Spectroscopes and Spectrometers
Measuring and Reading Microscopes and Telescopes, Filar Micrometers, etc.
Cathetometers
Magnetic Compasses and Dipping Needles
Leyden Jars
Magnets, Bar, Horseshoe and Electro
Electroscopes for Radioactivity and Ionization
Static Machines
Binding Posts and Connectors
Batteries
Rheostats, Lamp-Banks, etc.
Galvanometers, including Voltmeters and Ammeters
Induction Coils
X-Ray Outfits

CHEMICAL APPARATUS

Alundum ware
Balances and Weights
Beakers
Bottles
Bunsen Burners, Alcohol Lamps, etc.
Burettes
Calorimeters
Casseroles
Centrifuges
Clamps and Supports
Condensers
Corks
Crucibles
Cylinders, Graduated and Plain
Desiccators
Distillation Apparatus
Drying Ovens
Evaporating Dishes
Electrolytic Apparatus
Extraction Apparatus
Filtering Paper
Flasks
Funnels
Gas Apparatus
Glass Tubing
Graduates
Hydrometers
Jars
Mortars
Ovens
Pipettes
Platinum
Pyrometers
Quartz Ware
Retorts
Rubber Stoppers, Tubing, etc.
Stopcocks
Siphons
Test Tubes
Thermometers
Water Baths

CHEMICALS AND MINERALS

Merck's, Baker's, etc.

PROJECTION APPARATUS

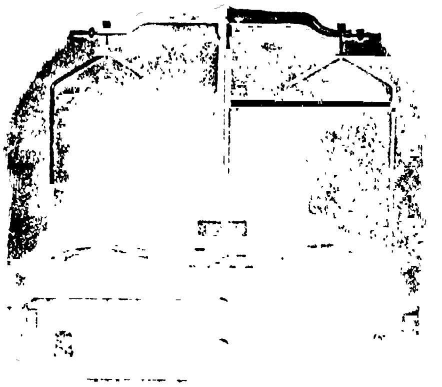
Lanterns, Stereopticons, Screens and Accessories

PHOTOGRAPHIC SUPPLIES

Cameras
Lenses
Chemicals
Paper, Films and Negatives

BIOLOGICAL APPARATUS

Microscopes and Microtomes
Slides and Cover Glasses
Dissecting Instruments
First Aid Cabinets
Charts and Models



ONE OF OUR SPECIALTIES

Laboratory Balance B645, capacity 500 grams, sensibility 1 decigram, beam 7½ inches between knife edges.
Price $9.00 each. Special reduction will be made in quantity.

RICHARD D SUTTON, GEN. MGR.

STANDARD WATER SYSTEMS CO.

Engineers, and Manufacturers of

Tripure Water Stills

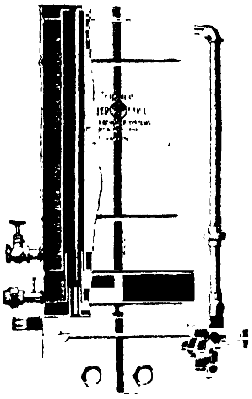
50 CHURCH STREET, NEW YORK, N. Y.

PRODUCTS

Water Stills for every laboratory and commercial use.

LABORATORY WATER STILLS

Construction—These Water Stills are made by skilled workmen with the highest grade of materials. The shells are heavily nickeled copper; the tubes and coils are of seamless drawn copper, and the chambers are of the finest cold rolled copper. All surfaces coming in contact with the steam and the distillate are heavily lined with pure block tin to insure the purity of the product.



TRIPURE LABORATORY WATER STILL

Heating Methods—These Stills are furnished to be operated by gas, electricity, steam, or kerosene.

Capacities—The Tripure Water Still is supplied in capacities from the smallest laboratory sizes to the largest industrial units furnishing a product of the greatest purity.

Record of Purity—Tripure Water is indorsed by leading chemists in the strongest terms for its purity, for all sanitary purposes, as well as in all of its applications for technical work.

SOME INSTALLATIONS

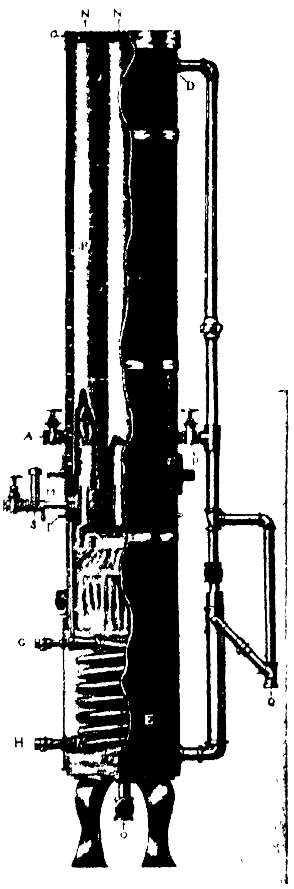
Acheson Oildag Co., Port Huron, Mich.
Barrett Company, Undercliff, New Jersey
National Aniline & Chemical Co., Buffalo, N. Y.
General Chemical Co., Undercliff, New Jersey
Columbia College of Physicians & Surgeons, New York City.
Cornell University, Ithaca, New York.
International Harvester Co., Chicago, Ill.
Rockefeller Institute for Medical Research, Plainsboro, N. J.
U. S. Bureau of Standards, Washington, D. C.
U. S. Department of Agriculture, Washington, D. C.
U. S. Naval Hospital, Portsmouth, Va.
E. I. du Pont de Nemours Co., Wilmington, Del.
Hooker Electrochemical Co., Niagara Falls, N. Y.
Hanovia Chemical Co., Newark, New Jersey.
General Electric Co., Schenectady, N. Y.
Colgate & Company, Jersey City, N. J.

EXCLUSIVE FEATURES

Our Tripure Laboratory and Industrial Water Stills will produce their full capacity with 10 lbs. to 25 lbs. steam pressure.

The top of the condenser is open and insures the elimination of all impure gases during the process of distillation.

The process of aeration **which can be operated or not** consists of admitting by suction into the steam thoroughly sterilized air in the proper quantities before condensation resulting in a distillate remarkably palatable, which process is controlled by patents.



WRITE FOR CATALOGS

TRIPURE INDUSTRIAL TYPE

STEACY-SCHMIDT MANUFACTURING CO.

Lime Kilns and Complete Hydrating Plants

ARCH STREET, YORK, PA.

Code Address [illegible]
Codes used, [illegible]
Edition and [illegible]

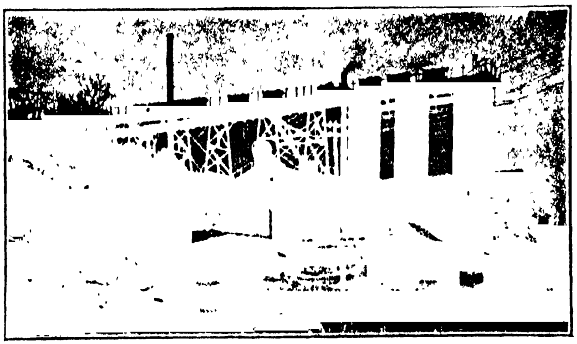
PRODUCTS

- Keystone Lime Kilns
- Complete Lime and Hydrating Plants
- Belgian and other type kilns for extraction of Carbon Dioxide Gas
- Equipment for Eldred Process of Burning
- Turntables
- Sugar Machinery
- Char Kilns
- Dryers
- Evaporators
- Bag Filters
- Crystallizers
- Stacks
- Tanks
- Castings
- Special Equipment from Engineers' designs

KEYSTONE
LIME
KILNS

KEYSTONE LIME KILNS

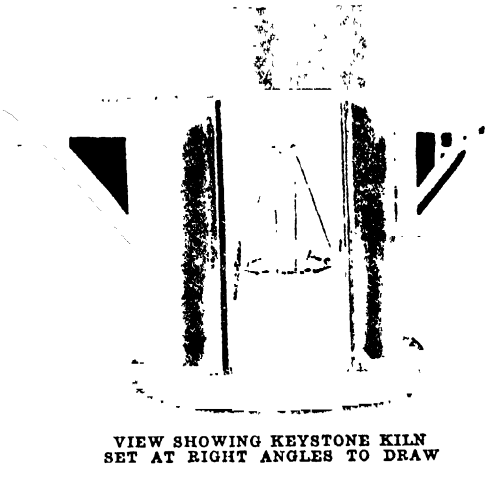
These Kilns are extensively installed throughout all the important lime producing centers of the United States, Canada, Mexico, Peru, Chili, Cuba, Porto Rico, Africa and South America, where they are satisfactorily meeting the demands of operators. Use of these Kilns guarantees uniform calcination, lowest operation and maintenance costs and a well-sustained tonnage.



GAS FIRED KEYSTONE LIME PLANT, CALCIUM PRODUCTS CO., HOLLIDAYSBURG, PA.

Construction—The extraordinary strength and durability of the Keystone Kiln is explained by the high quality, all-steel, brick-lined construction. This insures continuous operation and absolute dependability from breakdown. Cross section view of the Kiln, shown on the right, illustrates all the important features of construction and design.

Fuel—Keystone Kilns are designed to efficiently burn either coal, wood, producer gas or oil as fuel. The simplicity of the Kiln permits easy and inexpensive transfer from one fuel burning system to another,—should original operating conditions change and require such action.

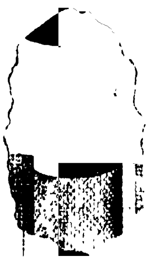


VIEW SHOWING KEYSTONE KILN SET AT RIGHT ANGLES TO DRAW

Specifications—

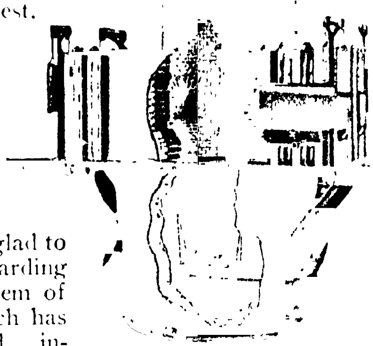
Outside diameter of Kiln	[illegible]
Height of Kiln	[illegible]
Diameter of Kiln inside brick lining	[illegible]

Capacity—The capacity of the standard Kiln is dependent both upon the nature and quality of the rock to be burned and the kind and grade of fuel used. Experience has shown that 8 to 10 tons of lime may be produced per day, using coal or wood as fuel and 12 to 15 tons per day when oil is burned. Where producer gas is employed these figures will be increased to 18 to 25 tons per day.



Draft—Wherever desired and specified, we are in an excellent position to supply necessary equipment for burning with the aid of either forced or induced draft,—use of which will mean increased capacity often as high as 10% to 15%. Details will be gladly given upon request.

Eldred System—Keystone Kilns can be made adaptable for burning by means of the Eldred Process, using coal as fuel. We will be glad to give details regarding this patented system of burning lime which has brought decided increased production and numerous economies for many lime operators.



SECTIONAL VIEW KEYSTONE LIME KILN

Special Features—One of the many exclusive features that has brought an envious reputation to Keystone Kilns is the cooling cone with patented draw gates. (See Illustration.) This allows, when drawing the lime, to load direct into a box car, eliminating the extra handling caused by having the lime discharged upon the floor until cold.

ENGINEERING SERVICE

Our Engineering Department is ready at all times to furnish complete information regarding Keystone Standard Lime Kilns or any equipment manufactured by this company.

This department is composed of men thoroughly experienced in lime burning machinery and is well prepared to aid in the solution of difficult problems and to furnish complete lime and hydrating plants, either from our own specifications and designs or those submitted by the client.

THE STEARNS CONVEYOR CO.

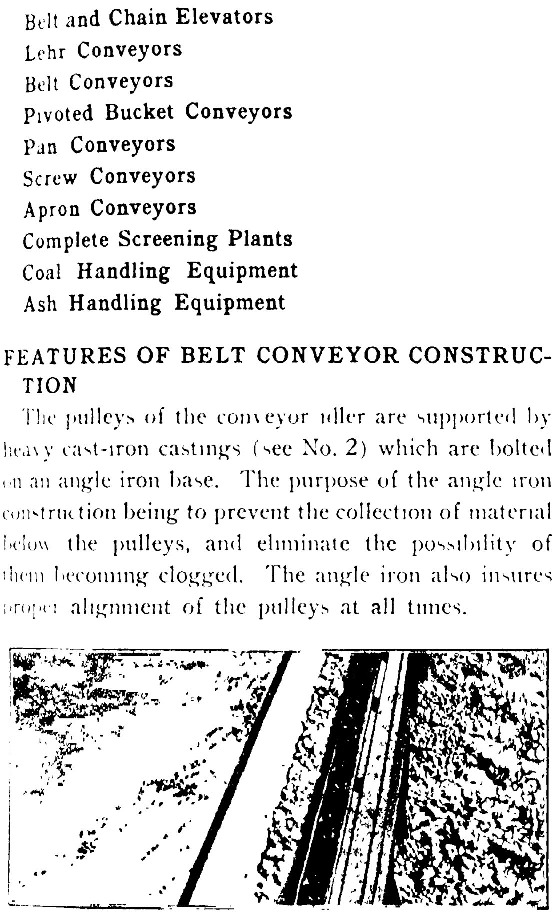
Engineers, Manufacturers
Conveying, Elevating and Screening Equipment
EAST 200TH ST. AND ST. CLAIR AVE., CLEVELAND, OHIO

PRODUCTS

- **Belt and Chain Elevators**
- **Lehr Conveyors**
- **Belt Conveyors**
- **Pivoted Bucket Conveyors**
- **Pan Conveyors**
- **Screw Conveyors**
- **Apron Conveyors**
- **Complete Screening Plants**
- **Coal Handling Equipment**
- **Ash Handling Equipment**

FEATURES OF BELT CONVEYOR CONSTRUCTION

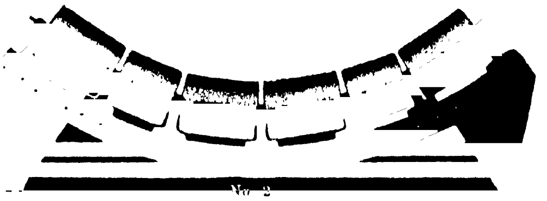
The pulleys of the conveyor idler are supported by heavy cast-iron castings (see No. 2) which are bolted on an angle iron base. The purpose of the angle iron construction being to prevent the collection of material below the pulleys, and eliminate the possibility of them becoming clogged. The angle iron also insures proper alignment of the pulleys at all times.



No 1
STEARNS GRADUAL TROUGHING TYPE BELT CONVEYOR

The mechanical construction and method of lubrication of the Stearns belt conveyor idler is unusual (see No 3). The common faults of disalignment and improper lubrication have been eliminated. Perfect alignment is assured by mounting Hyatt Roller Bearings on a single piece of seamless tubing. The outer race for the roller bearing is another piece of seamless tubing which carries the pulley itself. Thus the two roller bearings are always perfectly aligned.

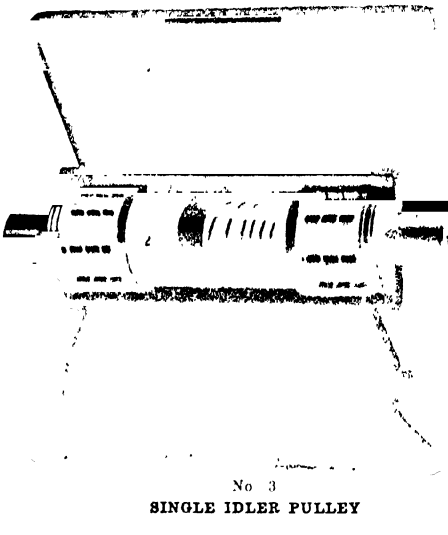
Upon proper lubrication depends the life of any machine. All Stearns conveyor idlers are equipped with the well known Alemite Lubricating System that is in use on many automobiles. The upper bearings on the inclined pulleys in all common forms of idlers suffer from lack of proper lubrication because gravity pulls the grease away, allowing the bearings to run dry. The Stearns pulleys are provided with grease chambers with floating plungers to force the grease to the upper Hyatt Bearings. The Lubricant is thus forced from the center out, providing a seal against grit and dirt. It is only necessary to lubricate once or twice a year, which can be done while the conveyor is in operation, by means of an Alemite grease gun.



No 2
BELT CONVEYOR IDLER WITH ALEMITE LUBRICATING PLUGS

The three principal causes for shortening the life of the idler have been improper lubrication, grit, and disalignment. With these difficulties eliminated the life of the equipment is greatly prolonged. The cost of maintenance, expense of repairs, and inconvenience are reduced to a minimum.

The case of the belt conveyor is typical of the mechanical refinements of all Stearns products.



No 3
SINGLE IDLER PULLEY

Grease enters at 1, passes through 2, filling grease reservoir and pressing back plunger

Established [illegible]

THE A. T. STEARNS LUMBER CO.

BRANCH OFFICES
166 Devonshire St
19 Federal St
Boston

MAIN OFFICE
NEPONSET, BOSTON, MASS.

SALESROOM
1 Sudbury St, Haymarket Square
Boston

PRODUCTS

Wooden Tanks for all purposes of any size, round or rectangular, including Storage Tanks, Vats, Acid Towers and Blow Tanks.

Paper Mill work a specialty.

STOCK AND FACILITIES

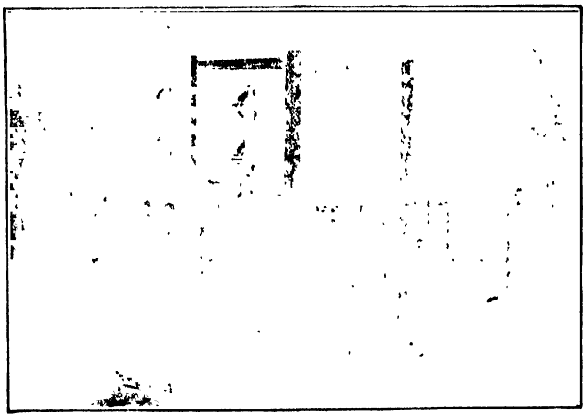
We control cypress swamps and sawmills in Florida where we make the lumber into the proper thickness and sizes for use in our factory at Neponset, Boston, Mass

As we carry large quantities of cypress in stock seasoning we can construct and ship promptly We also build tanks of southern pine for paper mill and other work

FIVE CYPRESS TANKS AT THE NORTH EASTERN ELECTRIC SMELTING CO.'S PLANT, WALLSEND-ON-TYNE, ENGLAND

Cypress is our specialty because its natural element makes it especially adaptable for use in tanks

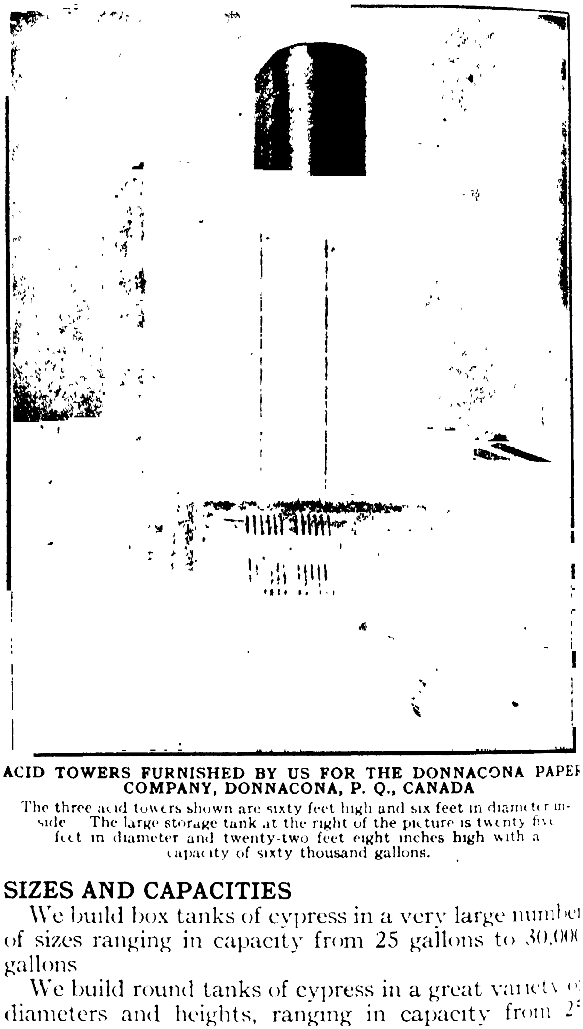
Our tank factory occupies a separate building fitted with special machinery designed expressly for the manufacture of tanks and kindred articles, large or small, including all necessary hoops or other iron work.



TANK INSTALLED FOR HOLLINGSWORTH & WHITNEY IN PAPER MILL AT WATERVILLE, MAINE

CYPRESS

This wood is probably more extensively used at the present time in paper, pulp and textile mills, chemical plants, dyehouses, breweries, etc, for the construction of tanks, vats, flumes, etc, than any other kind of lumber It is also extensively used for floors exposed to dampness The wonderful durability of cypress and its freedom from taint, taste, or odor make it especially desirable for such purposes



ACID TOWERS FURNISHED BY US FOR THE DONNACONA PAPER COMPANY, DONNACONA, P. Q., CANADA

The three acid towers shown are sixty feet high and six feet in diameter inside The large storage tank at the right of the picture is twenty five feet in diameter and twenty-two feet eight inches high with a capacity of sixty thousand gallons.

SIZES AND CAPACITIES

We build box tanks of cypress in a very large number of sizes ranging in capacity from 25 gallons to 30,000 gallons

We build round tanks of cypress in a great variety of diameters and heights, ranging in capacity from 25 gallons to upwards of 125,000 gallons.

We also build half-round tanks and special tanks for chemical and other plants fitted with partitions agitators, etc

SPECIAL WORK

We have furnished for pulp mills, both in the United States and Canada, a type of tank, or tower, over one hundred feet in height. We also furnish material for penstocks, which may be built of unlimited length We are furnishing large quantities of lumber for flumes dams, and other structures in or about water-power plants, and it has given excellent satisfaction. Our workmanship is the very best obtainable.

STEDMAN'S FOUNDRY AND MACHINE WORKS

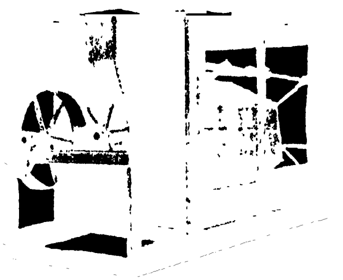
Established 1834

AURORA, INDIANA

PRODUCTS

Crushing, Grinding, Pulverizing, Mixing and Screening Machinery.

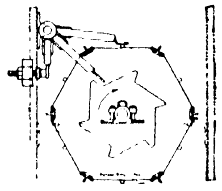
HEXAGON SCREEN WITH VIBRATING DEVICE


HEXAGON SCREEN

The Screen is cleaned automatically—No labor required. By a simple mechanical contrivance, due to numerous experiments made by us, we are now prepared to demonstrate to your entire satisfaction how the Stedman Hexagon Revolving Screen can handle your materials without the old and antiquated methods of employing labor to periodically clean away material from the Screen caused by clogging.

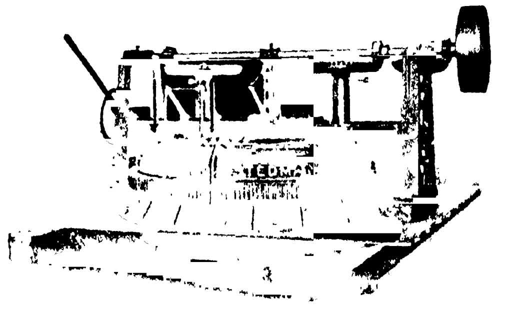
Perhaps you have been content with mixing and screening your materials with attendant difficulties, which may be trifles in your estimation, but nevertheless, a big factor in your costs. **Now**—these difficulties have been eliminated by the development of a practical, mechanical agitation to clean the Screen Cylinder and prevent it from clogging.

Screen plates have also been constructed so you can change them very quickly in a simple manner. Ask, for Bulletin 105.


DETAILS OF VIBRATING DEVICE WHICH KEEPS WIRE CLOTH CLEAN

MIXING PANS

For mixing in batches either wet or dry materials to a uniform consistency our Mixing Pans are particularly well adapted for such manipulating. We make a number of different styles and sizes to give any required capacity and to suit special installation conditions. We build 5, 6, 7 and 8 ft. Double and 5, 6 and 8 ft Single, all of which are fully described in our Catalog No. 14.


MIXING PAN

The above illustration is our new 8′ x 30″ Double Mixer Model "D"

Practical in design and rugged in construction

Ball bearing race surrounding the pan designed to give long service Note oilers

Large opening in center of pan to discharge quickly

Operating lever located at side of pan, which leaves the cover clear for feed connections

Ball Thrust Bearings under the bevel gears that drive the revolving plows

Pan 8 ft diameter, 30 ins deep inside Easy two ton capacity at a charge

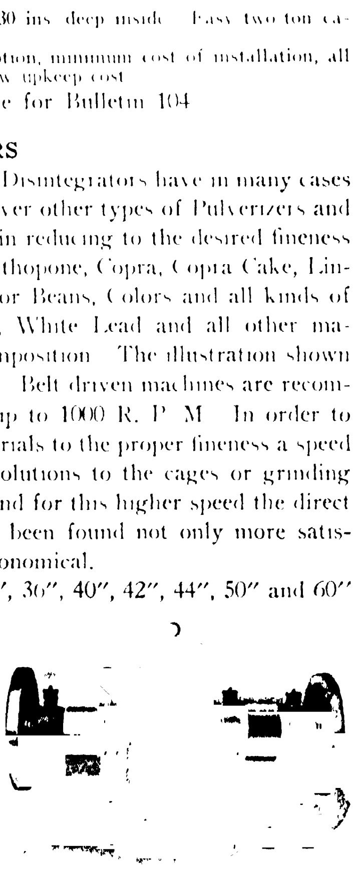
Low power consumption, minimum cost of installation, all parts accessible and low upkeep cost

Write for Bulletin 104

DISINTEGRATORS

Our Ball Bearing Disintegrators have in many cases effected economies over other types of Pulverizers and Grinding Machines in reducing to the desired fineness such materials as Lithopone, Copra, Copra Cake, Linseed Oil Cake, Castor Beans, Colors and all kinds of Chemical Materials, White Lead and all other materials similar in composition The illustration shown here is our 26″ Mill. Belt driven machines are recommended on speeds up to 1000 R. P M In order to pulverize some materials to the proper fineness a speed of 1000 to 2000 revolutions to the cages or grinding parts is necessary, and for this higher speed the direct driven machine has been found not only more satisfactory but more economical.

We also build 30″, 36″, 40″, 42″, 44″, 50″ and 60″ Belt Driven Disintegrators with special babbitted bearings, and we are in position to furnish any of the above sizes in 2, 3, 4 and 6 cage Mills.


DISINTEGRATOR

Catalog No. 12 and Bulletin No. 102 describe our complete line of Disintegrators.

F. J. STOKES MACHINE CO.

PHILADELPHIA, PA.

PRODUCTS

Rotary Vacuum Dryers	Drum Dryers
Vacuum Shelf Dryers	Autoclaves
Automatic Water Stills	Mixers
Impregnating Apparatus	Nitrators
Vacuum Evaporators	Vacuum Pumps

Barometric and Surface Condensers
Special Apparatus to Buyer's Specifications

COMPLETE PHARMACEUTICAL LINE

Single, Multiple and Rotary Tablet and Briquette Compressors.

Coating Machines	Polishing Machines
Ball Mills	Pot Mills
Power Mortars	Mixers
Granulators	Percolators
Emulsifiers	Bottle Fillers
Open and Vacuum Stills	Jacketed Kettles
Gelatine Capsule Machinery	Belt Conveyors
Tablet Triturate Molds	

Suppository Molds of Brass, Aluminum, etc.

ATMOSPHERIC DRUM DRYER

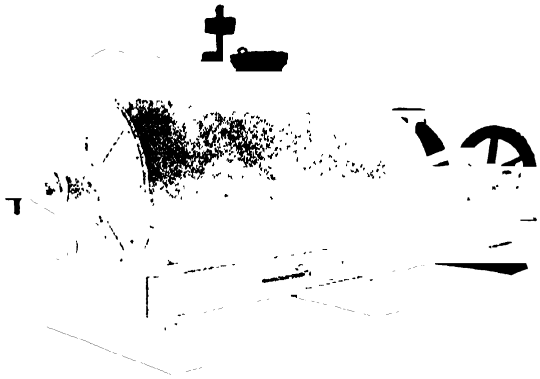
This Dryer is well adapted to the drying of precipitates, such as iron oxide, lead peroxide, arsenate of lead, etc., and also to the crystallizing of concentrated solutions, such as sodium benzene sulphonate. The liquor is fed continuously to the lower surface of the steam heated drum. It dries as the drum revolves and is scraped off in the form of a dry powder, which falls into a conveyor. Circulation and agitation of the feed liquor prevent precipitates from settling and insure an evenly dried product. The scraper knife is made of thin spring-brass and is reversible and easily renewed, and cannot injure the surface of the drum.

ATMOSPHERIC DRUM DRYER

We always recommend the installation of a variable speed transmission in connection with this dryer, so that the speed can easily be changed to suit the feed liquor, and to control the moisture content of the dry product. Thin liquors dry rapidly and require a greater speed than heavier liquors.

STOKES ROTARY VACUUM DRYERS

These are the most efficient dryers for materials that can be tumbled while drying, such as starch, [illegible], white lead, reclaimed rubber, crystals of various kinds, fish scrap, etc. These dryers are also very efficient in the **recovery of valuable solvents** such as alcohol and naphtha. The central shaft of our dryers carries a set of spiral mixing blades arranged in such a manner that the charge is thoroughly and constantly mixed and is distributed evenly in the dryer, insuring a uniformly dry product. When drying is complete the spiral blades sweep the material to the center of the machine where it is discharged, through a discharge outlet that can be operated without going under the machine. Our dry dust filter catches all the dust which would otherwise foul the condenser and pump, and keeps it dry so that it may be added directly to the main output of the dryer. We also supply all the necessary auxiliary apparatus, Barometric and Surface Condensers, Vacuum Pumps and Circulating Pumps.



ROTARY VACUUM DRYER

The Rotary Vacuum Dryer has recently been adapted to the **recovery of grease and oil** from various materials such as garbage, slaughter house residues, fish-scrap and oil-press cake. The whole process of extraction and drying is carried out in the dryer. Solvent and grease are separated in a direct steam still. Solvent remaining in the dryer is recovered during the drying process in a surface condenser.

DATA

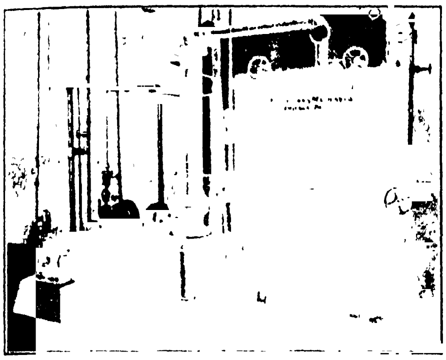
Size	Drying chamber	Heating surface sq ft	Working capacity cu ft	Overall dimensions		
				Height	Width	Length
59-A	1'6" x 3'6"	17	3	1'	2'	[illegible]
59-AA	2'0" x 6'0"	38	10	4'	3'	[illegible]
59-AB	2'6" x 8'0"	63	20	5'	4'	11
59-B	3'0" x 15'0"	164	50	6'	5'	[illegible]
59-C	4'0" x 20'0"	314	125	6'	6'	[illegible]
59-D	5'0" x 25'0"	550	200	7'	7'	[illegible]

Note Dryers of the above standard diameters can be furnished in other lengths than those listed above.

Continued on Next Page

VACUUM SHELF DRYERS

These dryers are used for all kinds of materials that can be handled in pans or in sheets. Materials sensitive to heat and oxidation are dried rapidly and uniformly at a temperature which is under ready control. If the material to be dried is especially sensitive to heat hot-water circulation is used for heating in the place of steam. The shelves are made seamless by electric welding and are tested to stand 100 pounds pressure. Any shelf can be quickly removed without disturbing the others.



VACUUM SHELF DRYER

This type of dryer uses steam very efficiently as the steam does not come in contact with the external shell and there is consequently little loss by radiation.

The labor cost on this type of dryer runs higher than on the rotary and drum types. It is used for a large number of products which cannot be tumbled while drying, such as foods, chalk-cones, percussion caps, wood and various other materials the physical properties of which must be preserved.

VACUUM SHELF DRYERS NO. 54 (Shelves 58" x 80")

Size	Number of shelves	Clearance between	Shelf area sq ft	Heating surface sq ft
54 AA	23	2.44"	741	1548
54 BB	20	2.63"	644	1346
54 B	17	3.19"	547	1144
54 CC	16	3.60"	515	1077
54 C	13	4.75"	419	875
54 DD	14	2.08"	451	942
54 D	12	2.61"	386	807
54 EE	11	3.00"	354	740
54 E	10	3.44"	322	673
54 FF	9	4.00"	290	605
54 F	8	4.71"	258	539

VACUUM SHELF DRYERS NO. 55 (Shelves 44" x 40")

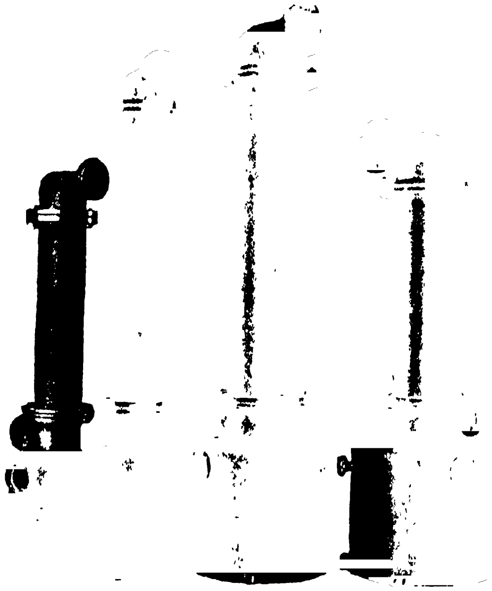
Size	Number of shelves	Clearance between	Shelf area sq ft	Heating surface sq ft
55 AA	23	2.02"	281	598
55 BB	20	2.50"	244	520
55 B	17	3.16"	207	442
55 CC	15	3.75"	183	390
55 C	14	4.12"	171	364
55 DD	14	1.96"	171	364
55 D	12	2.50"	147	312
55 EE	11	2.85"	134	286
55 E	10	3.22"	122	260
55 FF	9	3.72"	109	234
55 F	8	4.50"	97	215
55 GG	7	2.08"	85	182
55 G	6	2.78"	73	156
55 HH	5	3.60"	61	130
55 H	4	5.17"	49	104

We also build a small shelf vacuum dryer for laboratory use. The shelves are 12" x 18" and the clearance space is 4". A condenser and receiver form the stand of the dryer.

SURFACE CONDENSERS

The illustration shows an assortment of our vertical surface condensers. They are equipped with either brass or iron condensing tubes, depending on the requirements. They are mounted on receivers for collecting the condensate and are provided with windows for observing the flow of the condensate. They are also equipped with a by-pass and valve for draining without interrupting the action of the apparatus.

We also manufacture barometric condensers in various capacities, to be used in connection with our vacuum dryers and vacuum evaporators.



SURFACE CONDENSERS

Size of Apparatus	A	B	BS	C	D	DS
Cooling Surface, Sq Ft	18	30	43	51	79	130
Overall Height	6'8"	8'8"	8'8"	7'9"	9'9"	9'9"
Capacity of Receiver, Gals	20	20	20	60	60	60

VACUUM EVAPORATORS

Vacuum evaporators of the standard type both single and multiple effect we build in various sizes, of cast iron, steel, or copper. Standard diameters are 30, 36, 42, 48, 60, 72, 84 and 96 inches. The height varies according to the nature of the liquid to be evaporated. We also build crystallizing evaporators.

Jacketed evaporators of the type used in pharmaceutical laboratories are built by us, standard sizes being 25, 50, 75, 100, 250, and 500 gallons. These are usually built of copper either plain or tin-lined. We also make them of steel plate.

These evaporators are equipped with various kinds of condensers depending on the size and the purpose of the evaporator. On small installations, especially when the distillate is of value, we supply surface condensers as listed above. On larger installations where the distillate is not valuable we supply either the barometric condenser or a jet-condensing pump.

Continued on Next Page

STEAM OPERATED STILL

AUTOMATIC WATER STILLS

An extremely simple and efficient water still, easy to operate, easy to clean. Water which is to be evaporated is preheated by the condensation of the water already evaporated. Gases thus are liberated. Connections between the boiling chamber and the condenser keep the water at a constant level and make the operation continuous and automatic. The stills are made in a variety of sizes as listed below and can be operated with almost any source of heat.

We have over five thousand water stills in operation, in a very wide field, including chemical laboratories, industrial plants, hospitals, wholesale and retail drug houses. The government purchased about five hundred of our small kerosene operated stills for use in base and field hospitals.

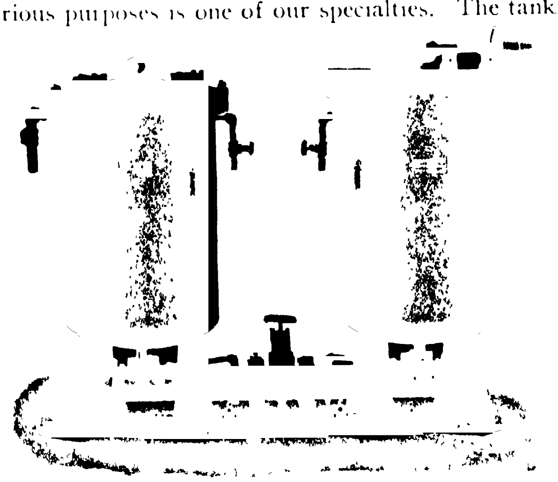
Size	Heat	Gals per hour
0	Gas	½
0	Gasoline	½
0	Electric	½
00	Gas	¾
00	Steam	¾
000	Gas	2¾
000	Steam	2¾
1	Steam	5
2	Steam	10
3	Steam	25
4	Steam	60
5	Steam	100

We also furnish Multiple Effect Stills for the production of pure water in large quantities. Quotation on application.

GAS OPERATED STILL

IMPREGNATING APPARATUS

Impregnating apparatus for the treatment of field and armature coils, pencil slats, and wood blocks for various purposes is one of our specialties. The tanks are arranged for the use of heat, vacuum, and pressure to assist in forcing the compound into the pores of the material treated. These tanks can be made in any size.



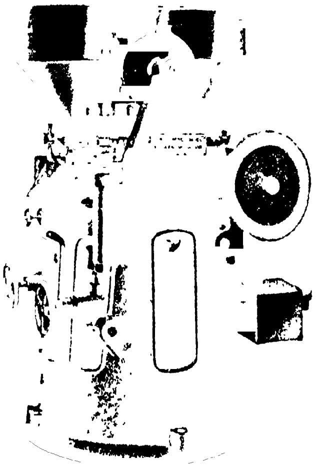
IMPREGNATOR

We have standardized tanks having diameters 2, 24, 36, 48, and 72 inches The tanks are hea steam, gas, or hot liquid as the conditions requ

BRIQUETTE AND TABLET COMPRESSING MACHINES

We manufacture automatic machines for m tablets and briquettes and for counting and packing these into suitable containers. Sizes run from the smallest up to three inches in diameter, and almost any shape desired. Output up to 1500 per minute for small tablets and from 40 to 250 per minute for large briquettes.

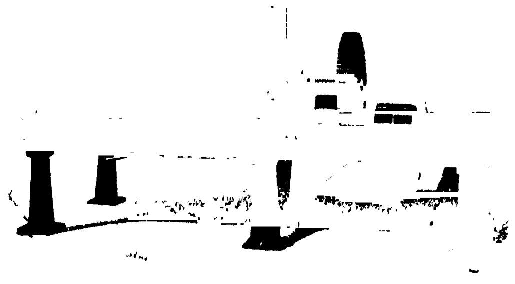
We have had wide experience in the manufacture of tablets and briquettes of all kinds. It is our custom to conduct experiments on any materials sent us, submit samples, and make recommendations free of all charge.



TABLET MACHINE

MIXERS

The illustration shows a steam-jacketed steel mixer. It is equipped with spiral mixing blades, similar to those used in our Rotary Vacuum Dryers, and has a bottom discharge. The structural steel frame makes this machine long-lived and dependable for the heaviest kinds of work. We also make mixers of galvanized iron, cast iron, aluminum, bronze, etc., either with or without steam-jackets. Some of our mixers are arranged to tilt for discharging. This is sometimes more convenient than the bottom discharge.



STEAM-JACKETED MIXER

POWDER FILLING MACHINES

These machines fill accurately all kinds of powders into a great variety of containers, at the rate of 20 to 30 packages a minute, depending on the size. Full information may be obtained on request.

LITERATURE

Catalogs will be mailed on request, giving full details regarding our complete line of—

Vacuum Dryers and Chemical Apparatus; Chemical and Pharmaceutical Machinery; Stokes Automatic Water Stills.

E. H. STROUD & COMPANY

ESTABLISHED 1896

928, 930, 932 and 934 Fullerton Avenue
CHICAGO, ILLINOIS

Engineers and Manufacturers of Machinery for the Reduction of All Sorts of Dry Grindable Materials, Animal, Chemical, Mineral, and Vegetable, and Some that Carry 6% to 8% of Moisture, also of Powdered Coal Burning Equipment

PRODUCTS: Crushing, Granulating, Disintegrating, Pulverizing and Shredding Machinery; Dust Collectors; Air Vent Chambers; Stokers and Combustion Chambers for burning Powdered Coal, for Locomotives, Steamships, Stationary Boilers, Stills, Retorts, Kilns, Metallurgical Furnaces, etc.

PIONEERS in the art of pulverizing and stoking and burning Powdered Coal, under Boilers and some other Heating Units.

STROUD POWDERED COAL STOKER AND BURNER

Receives the Powdered Coal, draws its own supply of Air from the atmosphere, measures the coal and the air as used, mixes them thoroughly, delivers the mixture to the furnace (where it ignites at once) and enables the operator to have complete control of furnace temperatures, and to make records from which to duplicate his results at will. We build also a Stoker for Locomotives.

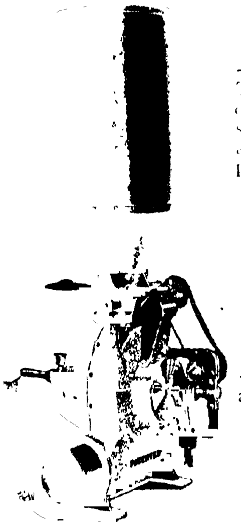


Illustration is of our Left-Hand Stoker. We build Right-Hand as well

Stoker can also be built for either upward or downward delivery

Slide ——→ to start and stop flow of coal

Pulley ——→ or Electric Motor or Steam Turbine, as desired

Outlet ——→ of Fuel Mixture

←——The Coal Tank can be of other size and shape, or can be a metal barrel, if preferred

←—— Sprockets, Chain, Worm and Gear, which drive the Conveyor from spindle of fan, and automatically govern the supply of coal

←—— Air Inlet and Controller

All persons are **warned** that the ideas embodied in the "Stroud Powdered Coal Stoker and Burner" have been well covered by fundamental patents.

PATENTED

Sizes and Capacities from 15 lbs. to 5000 lbs. of coal per hour per stoker with all the air needed for combustion. **Write for Bulletins, "A" and No. 107.**

CRUSHING AND GRANULATING ROLLER MILLS

With either pointed or chisel-shaped cutters, or fluted rollers, one pair, two pairs, or three pairs of rolls high, per mill **Ask for Bulletin "A."**

STROUD AIR SEPARATION PULVERIZERS

Our illustration shows a Product Collector attached to the Pulverizer. We build Air Vent Chambers, too

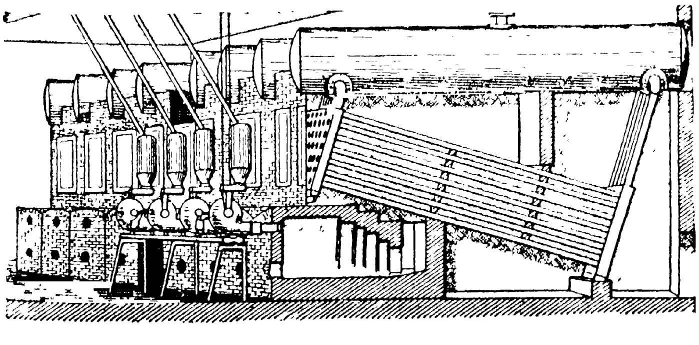
These mills give a finished product direct which, without subsequent sieving, is so uniformly fine that 95% or 98% or all of it, as wanted, will, if tested when dry, pass through a horizontal brass wire cloth testing sieve of the desired mesh, which can be any mesh from, say, 40 x 40, down to the most impalpable powders, far finer than a 200 x 200 mesh. They are without exception the most efficient Pulverizers made. Dustless in operation. Difficult to clog. Easy to clean. A cool Pulverizer for chemicals. So automatic in feeding and operation that one man can attend half a dozen mills. Cost of milling very low. **Ask for Bulletin No. 101.**

THROW-OUT-BOX-END-DOOR

For cleansing materials from imperfect and foreign matter during process of pulverization. **Ask for Bulletin No. 101-B.**

STROUD SCREEN SEPARATION CRUSHING AND GRINDING AND SHREDDING MILLS

Ask for Bulletin No. 102-B.



ROUGH SKETCH OF A TYPICAL STROUD POWDERED COAL INSTALLATION

We have purposely made an incorrect drawing of the Furnace and some other details because we do not wish to advertise or give away gratis information which has cost us considerable time and money and effort.

Our installation is as simple as that shown, and gives entire satisfaction.

ESTABLISHED 1867

THE A. W. STRAUB COMPANY

The Quaker City Drug and Chemical Mills

FACTORY AND GENERAL OFFICES

3737-41 Filbert Street, PHILADELPHIA, PA.

PRODUCTS

Quaker City Drug and Chemical Mills; Hand, Power, and Electric.

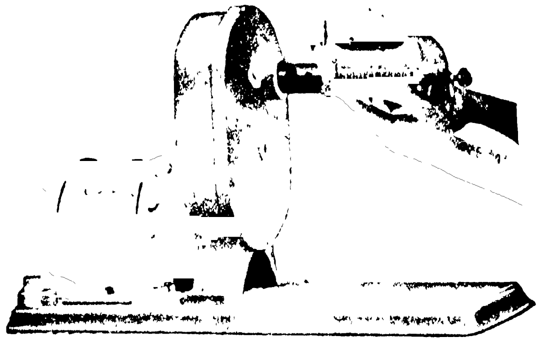
ELECTRIC LABORATORY GRINDING MILL

This direct motor-driven Laboratory Grinder is mounted together with the electric motor on a heavy, substantial base which eliminates all vibration while the mill is in operation. The gear connection between motor and mill is fully enclosed in the cast-iron stand supporting the mill at a height allowing a receptacle to be placed under the discharge opening

A ball box bearing is provided at the extreme end of the grinding shaft to take up the thrust, thus insuring a very easy running mill and a consequent saving in power, wear and tear

This grinder is equipped with interchangeable Grinding Units, a unique feature found on our direct motor-driven Laboratory Grinder exclusively

The Grinding Unit, which is quickly and easily attached and detached from the driving mechanism, is furnished either for dry or wet grinding The low cost of the Grinding Unit enables you to buy a number of these units and use each unit for a definite purpose only Thus, you can have one unit for grinding foodstuffs, another for poisons, a third one for oily substances, an individual unit for each color, etc



SHOWING EASE OF ATTACHING A COMPLETE GRINDING UNIT

This Interchangeable Grinding Unit feature makes the mill a great labor and time saver in laboratories where many different substances are being ground and where the grinder has to be thoroughly cleaned with every change of material when only one grinder is available.

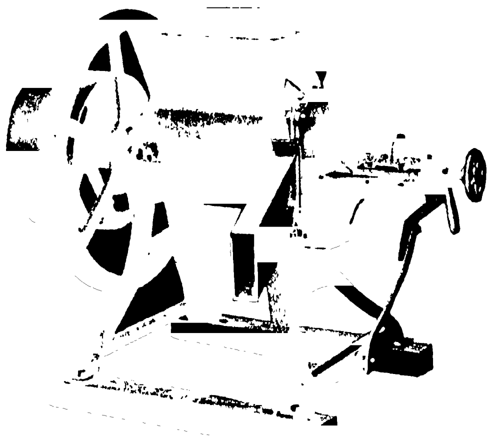
The dry grinding unit will successfully grind products such as: Barks, Roots, Seeds, Gums, Re Chemicals, Minerals, and Metals of all kinds

The wet grinding unit, which is equipped with a different crusher and plate, will handle all sorts of wet and oily substances

An extra set of grinding plates, Cutler-Hammer push button switch, porcelain plug receptacle and 12-ft connector cord with a screw plug is furnished with this mill, ready to be connected to any lamp socket, either direct or alternating current as specified.

POWER DRUG AND CHEMICAL MILL

Our No A-10 Power Drug and Chemical Mill is highly efficient in performance and so simple in construction that it does not require a mechanic to operate it.



POWER DRUG AND CHEMICAL MILL, NO. A-10

Specifications

Capacity: 300 to 700 pounds.
Speed: 200 to 400 r p m
Power required: 3 to 5 H P
Floor space: 40″ x 22″.
Height of mill: 27″.
Pulleys: Tight and loose, 14″ x 5″.
Weight: 400 pounds.

Use

This mill is being successfully used for the grinding of drugs, chemicals, minerals, and metals of all kinds in the chemical, drug, glass, paint, cement, food products, and other industries.

Continued on Next Page

Other Mills

We also produce mills of this general type of the following capacities:

[illegible] 1000 pounds per hour
[illegible] 600 " " "
[illegible] 150 " " "
[illegible] 350 " " "

SMALL POWER DRUG AND CHEMICAL MILL

Our No G-6½ Style C Power Drug and Chemical Mill has a capacity of 50 to 100 pounds per hour It requires a floor space 26 x 14 inches, and is 18 inches high It requires 1½ to 2 horsepower and weighs 125 pounds.

We produce this mill both with and without delivery fan, and can recommend it highly for all branches of the chemical industry requiring a small capacity, efficient mill

CONSTRUCTION

All Quaker City grinding mills are constructed of the best grade of materials Each machine is mounted on a heavy, substantial base, which completely eliminates the vibration of the mill, when in action The frame of each mill is built of heavy iron, making a strong, well-built machine for hard and constant use

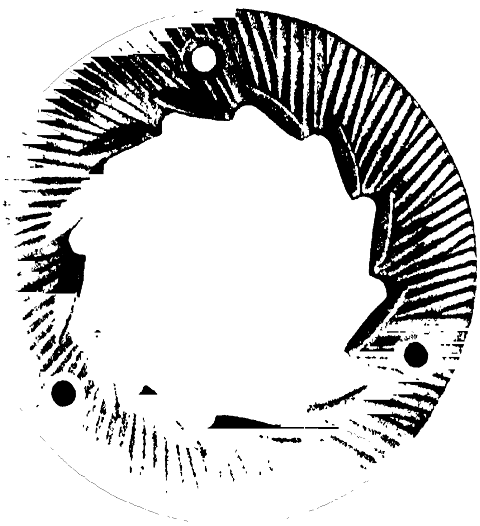
The journals are heavily babbitted with an anti-friction metal which wears for years without renewing The shaft runs the complete length of the mill, with journal boxes properly placed, connecting directly with the source of power, thus eliminating the use of gears, which are the source of unending trouble At the end of the shaft is a ball box bearing to take care of the thrust at the end of the spindle The ball box bearing is separate and distinct from the machine Not being cast with the mill parts, it can be, in case of breakage or wear, removed very readily and a new bearing substituted This feature together with the direct connection reduces the friction and consumes less power

BALLS IN TRACK

BALL BOX COMPLETE

The grinding plates of any mill, where the work is done, constitute practically the heart of the mill Any heart disease here means more power consumption, less production, over-heating, or a poor, inferior and uniform product Tests made by us have long since proved that Quaker City grinding plates grind faster and truer with less power consumption than any other type or make This is due to the construction of the plate which is flat, and to the metal used; the latter being exceptionally hard and resisting wear for a long time

While stones and hard substances should be removed from the material to be ground as thoroughly as possible, there are always some foreign substances remaining A pebble passing into the mill and through the plates will be ground up so fine as to be entirely unnoticeable in the finished product, and without any injury whatever to the grinding plates.



QUAKER CITY GRINDNG PLATE

Notice in the illustration above, that the tramming ring seat is provided with a slight concave corner which holds the tramming-ring to which the stationary plate is bolted, a sufficient distance away from the tramming-ring seat to permit a rocking action, a flexibility which prevents both the stationary, and the revolving plates from wearing unevenly, making a perfect grinding surface absolutely certain Also, should any hard substance such as nails, tins, etc , pass through the plates, this flexibility permits them to pass without injury to the plate

This feature is to be found on a Quaker City Mill only

The plates wear extremely well— and when worn beyond a good grinding surface can be discarded, as new plates are supplied at a low cost, in fact, at a price far below the cost of cones An extra set of plates is sent with each mill

GUARANTEE

Quaker City Mills are sold on a positive guarantee We will bill you in the regular way and allow you a ten-day trial of the mill at our expense If it is not satisfactory, we want you to return the mill to us Each part is guaranteed against defective workmanship and material for a period of one year

Our half a century of grinding experience is back of each machine Each mill must do its work right

SERVICE

Our laboratories are prepared to test any product you have, and we shall be very glad to have you send us samples We will grind them in any manner you desire, and submit them with our recommendations as to which mill will best do the degree of grinding desired

Expert advice on any phase of grinding and pulverizing gladly given.

USERS

There are thousands of these mills doing service all over this and many foreign countries Some of the largest drug and chemical manufacturers in the United States are using our mills with entire and continuous success

STRUTHERS-WELLS COMPANY

Steel Plate Construction: Riveted and Welded

WARREN, PENNSYLVANIA

New York Office, [illegible] Church Street

[illegible] [illegible]

PRODUCTS

A general line of steel plate construction made with riveted or welded seams, or shipped knocked down, including equipment for—

- Acid Works
- Powder Plants
- Paper Mills
- Oil Refineries
- Wood Alcohol and Turpentine Plants
- Chemical Works
- Soap Factories
- Paint and Varnish Works
- Sugar Refineries
- By-Product Coke Oven Plants

and for any industry using or handling articles manufactured of steel plate.

Tanks, for Storage, Pressure or Vacuum

- Filters
- Coolers
- Agitators
- Steam Pans
- Digestors
- Stills
- Retorts
- Condensers
- Riveted Pipe
- Jacketed Kettles

WELDING

Done Electrically and by the Oxy Acetylene Process. Highest Efficiency

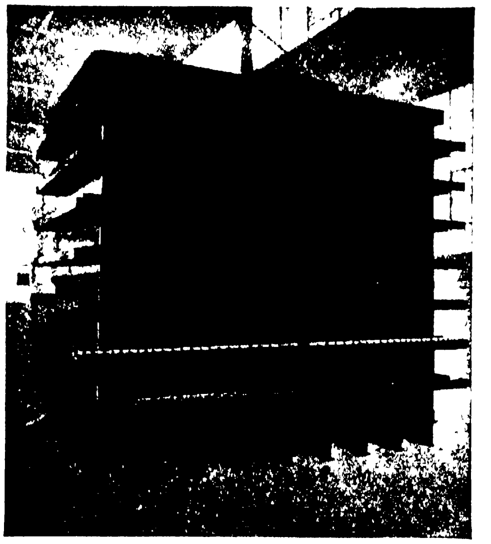
WOOD ALCOHOL PLANTS

More than 90 per cent of the Wood Alcohol Plants in the United States and Canada have equipment made by us. Send for free booklet.

GENERAL CATALOG SENT ON REQUEST

We estimate and quote on work of special character from purchaser's specifications.

We assist you in designing your work. Submit your problems

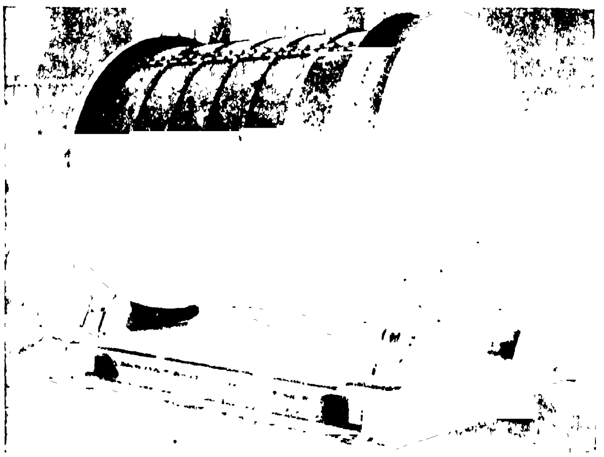


RECTANGULAR VACUUM TANK

A Rectangular Tank 17 feet long, 9 feet wide and 16 feet deep, with welded seams, braced on the outside with I beams to withstand 29 inches vacuum In use as a Vacuum and Impregnating Tank The cover is of cast iron, arched and braced for strength and hinged for opening and closing

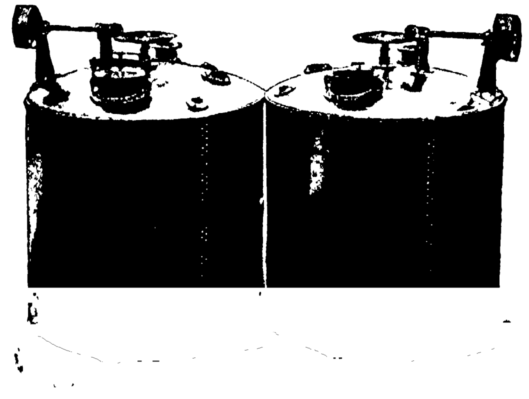
FACILITIES

The plant, covering seven acres, is a complete unit within itself, having **Plate Fabricating Shop, Machine Shop, Foundry, Pattern Shop, Oxygen** and **Acetylene Generating Stations,** etc —all of modern construction and equipped with up-to-date tools and machinery. It is, therefore, independent of outside sources of supply, and a completed job can be accomplished from the incoming steel plates to the outgoing finished material A competent **Engineering Department** is at the service of customers, as is, also, the experience of nearly seventy years in the business. The Foundry furnishes gray-iron and semi-steel castings up to 15 tons each The Machine Shop tools include a boring mill with a swing of 13 ft., while the tools of the Plate Shop include hydraulic riveters up to 16 ft. throat Other equipment in proportion.



ROTARY DRUM

A Revolving Cylinder 6 feet in diameter by 8 feet long The shell is of perforated plate, removable in sections, bolted in place and supported by a framework of shapes and bars A complicated piece of construction requiring accurate and careful workmanship throughout



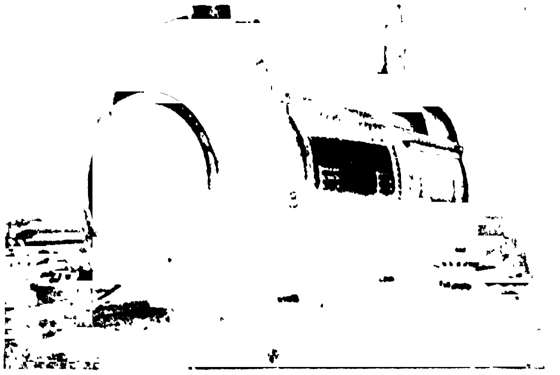
MIXING TANKS WITH AGITATORS

Two Tanks, each 8 feet in diameter by 8 feet high, with mixing apparatus and driving gears Tanks similar to these in construction can be steam jacketed or equipped with steam coils.

Continued on Next Page

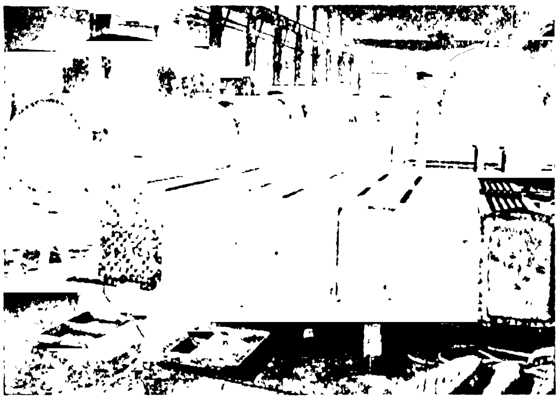
RECTANGULAR OVEN RETORT

Used in the distillation of hard woods These retorts may be had in any length from 32 ft to 56 ft



A SPECIAL TYPE OF SURFACE CONDENSER

This Condenser is 7 feet by 14 feet Access is gained to the interior for cleaning through the removable side sections of the shell.



TUBULAR HEATERS

In various stages of construction These can be made with either riveted or welded joints Note also the large tank on the left and the door of an impregnating tank on the right

STORAGE TANKS FOR OXYGEN

Four Pressure Tanks 5 feet diameter, 35 feet long, for the storage of oxygen under 300 pounds pressure per square inch These tanks were subjected to a test pressure of 450 pounds per square inch and were designed with an ample factor of safety. They are an example of thoroughly high grade riveted work.

CREOSOTING CYLINDER

6 ft 2 ins diameter, 106 ft long, tested to 375 lbs per sq. in.
Also a miscellaneous assortment of steel plate work

THE STUART & PETERSON COMPANY

Plain and Porcelain Lined Cast Iron Chemical Equipment

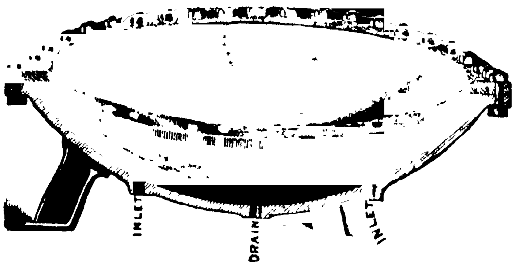
BURLINGTON, N. J.

PRODUCTS

Enameled and Plain Cast Iron Chemical Equipment, ncluding:

- Autoclaves
- Caldrons
- Emulsifiers
- Evaporating Dishes
- Gates (Faucets)
- Kettles
  - Jacketed
  - Mixing
  - Plain
  - Tilting
- Mixers
- Pans
- Percolators
- Retorts
- Specialties
- Sterilizers
- Stills
  - Nitrating
  - Vacuum
- Stirrers
- Storage Cans
- Sulphonators
- Tanks

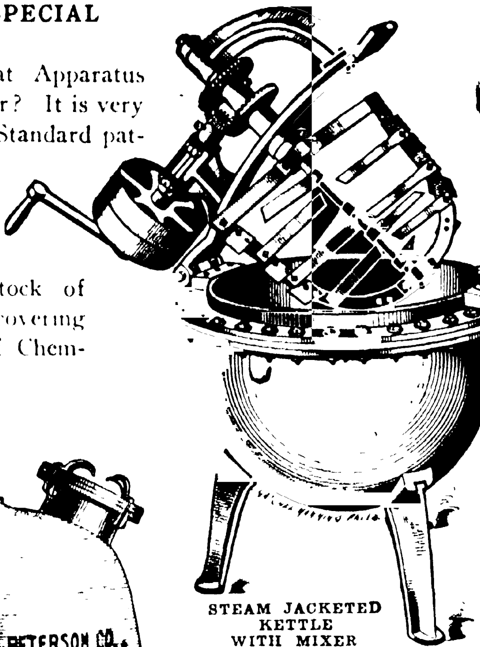
PORCELAIN LINED EVAPORATING DISH



STEAM JACKETED EVAPORATING DISH

STANDARD AND SPECIAL EQUIPMENT

Are you sure that Apparatus nust be Built to Order? It is very probable one of our Standard patterns may Solve your problem—at a very appreciable saving. Since 1840 we have assembled a vast stock of standard patterns covering almost every type of Chemical apparatus.



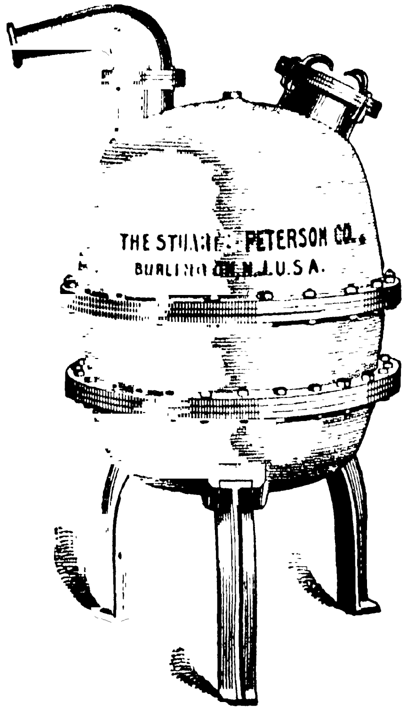
STEAM JACKETED KETTLE WITH MIXER

Stuart & Peterson equipment is known the world over for highest quality in design, workmanship and materials.

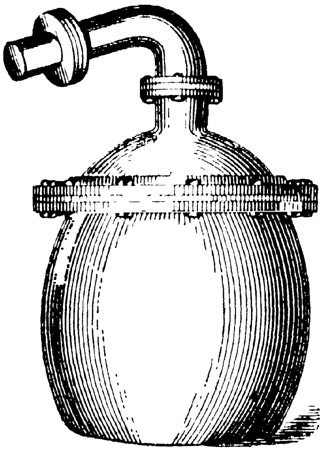
Standard equipment cannot always be adapted to conditions. In these cases our staff of skilled chemical and mechanical engineers will, after a careful study of requirements, design equipment that will fulfil the special requirements.

We also build to purchasers' plans and specifications.

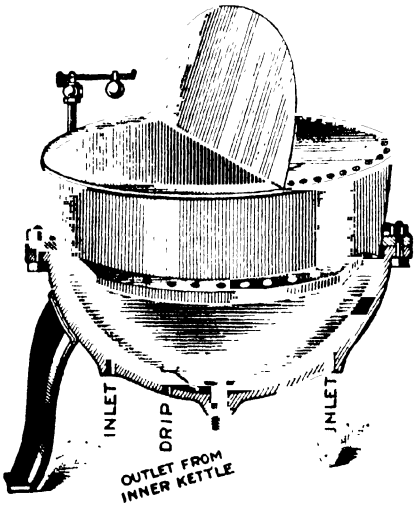
If you cook, boil, evaporate or distil, our catalog should be in your possession. Write for it today.


THE STUART & PETERSON CO.
BURLINGTON, N.J. U.S.A.

GOLDEN CROWN STILL



SUN STILL



STEAM JACKETED KETTLE WITH COVER

G. L. STUEBNER

Manufacturer of

Hoisting Buckets, Dump Cars and Melting Furnaces for Contractors' Service

Cor. Hancock Street and Vernon Ave.
LONG ISLAND CITY, N. Y.

Telephone
HUNTER'S POINT 0059

PRODUCTS

Turnover and Bottom Discharge Buckets; Steel Skips; Small Platform, End, Side and Bottom Dump Cars.

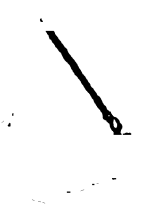
Also, Push Carts, Asphalt Melters, Pipe Line Lead Melting Furnaces, etc.

STANDARD SELF-DUMPING AND SELF-RIGHTING BUCKETS

Made in classes "A" and "B." Designed for use with stone, sand, clay, concrete, and materials of a similar nature.

Class "A"—Top of bucket is from eight to ten inches wider than the bottom, permitting the bucket to be quickly filled and rapidly dumped in a clean manner. Easily handled and well adapted for sinking shafts, sewer work and similar operations.

Class "B"—Similar to class "A," except that the sides are straight, of equal width top and bottom. This bucket is nicely balanced, has double bottom, strong bail, trunnions, reliable latch, also, weighs and costs less than class "A." See illustrations of various types of buckets made by G. L. Stuebner



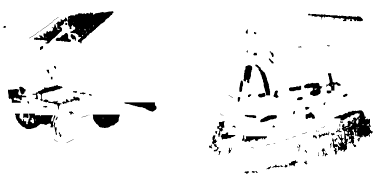
STEEL SKIP

"Controllable" Central Discharge Bucket—Used for depositing materials into smallest as well as largest equipment. Provided with patent pin-controlling device, to regulate width of discharge opening, and with powerful levers for controlling quantity of concrete running out.

"Excelsior" and "Invincible" Bottom Dump Buckets Particularly adapted to handle concrete, mud, clay, sand, rock and similar materials. Quick-acting, clean, dumping and labor-saving buckets.

DUMP CARS, PUSH CARTS AND MELTING FURNACES

Strongly built of best materials, in various types and sizes, for severe service. See illustrations.

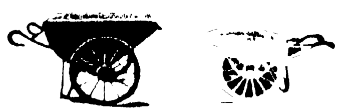


End Dump Side Dump
DUMP CARS

"Invincible" Bottom Dump (Patented)

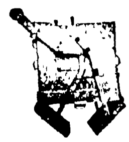
Self-Dumping and Self-Righting Turnover Type

"Excelsior" Bottom Dump (Patented)



PUSH CARTS

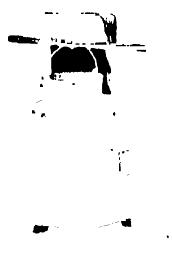
BOILER ROOM CHARGING WAGON



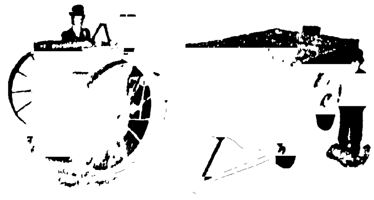
"Pin-Controllable" Central Discharge Pier Bucket (Patented)

"Controllable" Central Discharge (Patented)

Two-Line Bottom Dump (Patented)



STATIONARY LEAD MELTING FURNACE

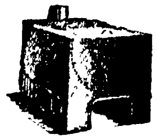


PORTABLE TAR MELTING BOILERS

Round Type Side- and Back-Lever Catch for Coal Hoisting
STUEBNER HOISTING BUCKETS

CAPACITIES, DIMENSIONS AND PRICES

Quoted upon application.



STATIONARY TAR MELTING FURNACE

CATALOG

Write for catalog and further information.

THE STUPAKOFF LABORATORIES

Established 1895

Hamilton and Fifth Avenues
PITTSBURGH, PA

PRODUCTS

The principal articles of manufacture of the Stupakoff Laboratories are:

Thermo-Electric Pyrometers, Precision Instruments, and Usalite—Pyrometer insulating and protection tubes.

Only a few of our products are illustrated herewith If further interested write for descriptive catalogs

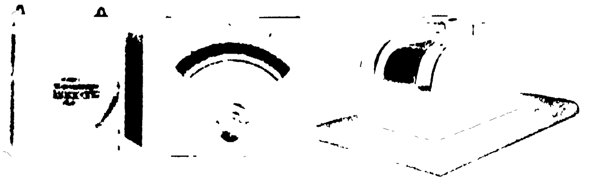
THERMO-ELECTRIC PYROMETERS

Thermo-electric pyrometers are of most extensive use in all chemical, metallurgical, glass and other ceramic industries, for the measurement of all temperatures from absolute zero to 3000 deg F.

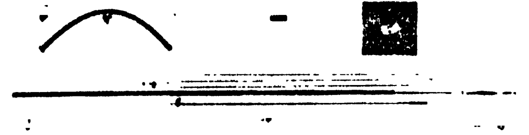
Simply constructed, readily handled, easily understood by ordinary workmen.

Adapted to the most varied requirements up to 3000°F., above which Optical or Radiation Pyrometers must be supplied.

Where it is essential to obtain accurate temperature measurement, much thought must be given to every detail in the construction of the apparatus, combined with a knowledge of the field to which it is applied We have specialized in the field of pyrometry for 25 years.

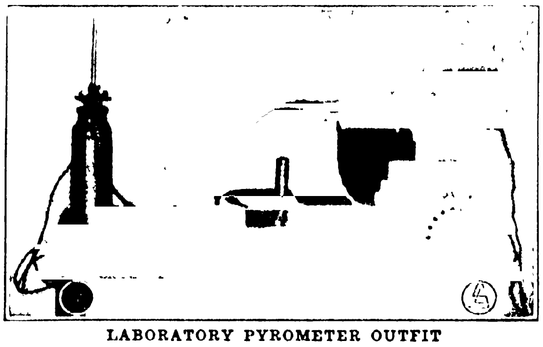


WALL TYPE **PORTABLE** **RECORDING**



INSPECTORS' PORTABLE PYROMETER OUTFIT

With universal joint tripod for galvanometer and right angled curved Usalite tube.



LABORATORY PYROMETER OUTFIT

Electric Furnace, Rheostat, Galvanometer, Thermo couple, Thermos bottle with Cold Junction Couples

USALITE

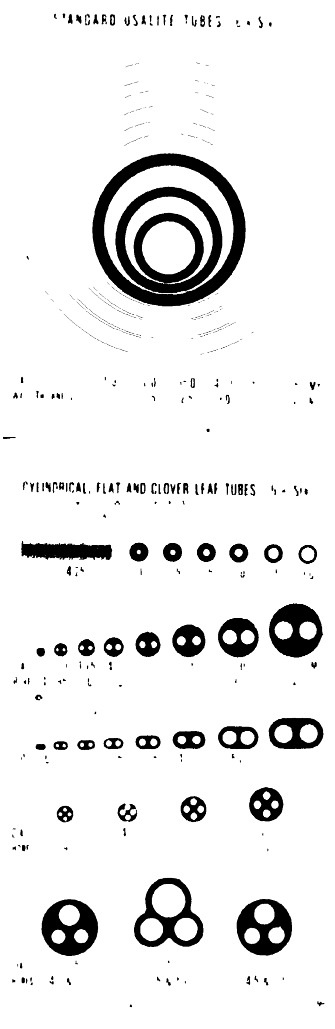
"Usalite" is a highly refractory porcelain coated with a hard glaze, impermeable to gases at very high temperatures.

This product is the result of very extensive experimenting to produce a superior Pyrometer Tube, based on our knowledge of, and especially made to meet all requirements of the manufacturing industries

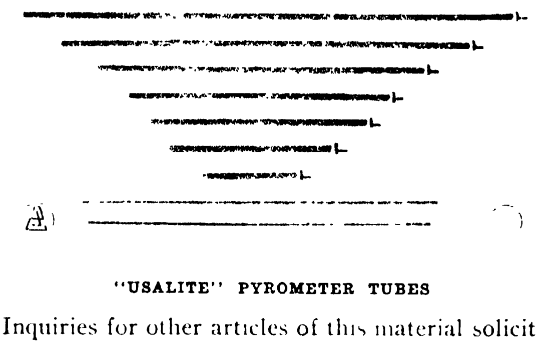
USALITE HIGH TEMPERATURE PORCELAIN PRODUCTS

It is very important to thoroughly protect the thermo couple wires—to have them always maintain their original physical and chemical properties. A change in the original properties of the thermo couple results in incorrect temperature indications, which are usually serious and costly. Usalite Pyrometer Tubes are built to protect the thermo couples,—and do.

The Stupakoff Laboratories specialize in making tubes for the protection and insulation of thermo couple wires.



STANDARD "USALITE" TUBES



"USALITE" PYROMETER TUBES

Inquiries for other articles of this material solicited.

Over 300 sizes carried in stock.

ASK FOR CATALOG

B. F. STURTEVANT CO.

HYDE PARK, BOSTON, MASS.

BRANCHES IN FOLLOWING CITIES

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Sturtevant
PUTS AIR TO WORK

PRODUCTS

Heating and Ventilating Equipment:

Multivane Volume Blowers and Exhausters
Propeller and Disc Type Volume Exhaust Fans

Heaters
Air Washers
Engines and Motors
Galvanized Duct Work
Portable Ventilating Sets

Power House Equipment:

Steam Engines
Steam Turbines
Fuel Economizers
Mechanical Draft Apparatus
Turbine, Steam Engine and Gasoline Electric Generating Sets
Generator Coolers
Transmission Gears

Air Conditioning Equipment:

Paper, Glue, Wood and Leather Drying and Vapor Absorption Systems
Air Washing, Humidifying and Dust Removing Systems
Dehumidifying Systems

Industrial Equipment:

High, Medium and Low Pressure Blowers
Volume Blowers
Planing Mill Exhausters
Cupola Blowers
Gas Blowers and Boosters
Gas Exhausters
Acidproof Fans
Steam Exhaust Heads
Forges and Forge Blowers
Pneumatic Collecting and Conveying Systems

ENGINEERING SERVICE

As each installation is unique, it is usually necessary that an engineer analyze the conditions before making recommendation.

The engineering staff of the B. F. Sturtevant Company has been trained to analyze all conditions and to properly apply the company's apparatus accordingly.

Consult this department, which is at the disposal of engineers and others without obligation.

PUBLICATIONS

The Sturtevant line is so varied that a comprehensive presentation in one publication is undesirable. This company has, therefore, issued a special bulletin on each particular line covering the mechanical details.

CATALOGS

Drying Apparatus

243. Paper Drying

Heating and Ventilating

271. Multivane Fans
238. Multivane Fans; Performance Charts
230. Heaters
227. Heating and Ventilating Layouts, Blue Print Book
201 Electric Dust Blowing Sets
237 Ready-To Run Ventilating Sets
1011. Heating and Ventilating Factories
1012. Heating and Ventilating Schools
1013 Heating and Ventilating Public Buildings
1015 Heating and Ventilating, Book Complete

Mechanical Draft

236 Forced Draft Fans
276 Turbo Undergrate Blowers, Design 5
256 Steam Turbines
217 D. C. Type "D" Motors
239 Vertical Engines

Vacuum Cleaners

244. Stationary Vacuum Cleaners
248. Architects' Hand Book

Planing Mill Fans and Dust Conveying Systems

185. Slow Speed, Low Power Planing Mill Exhauster
233. Slow Speed, Low Power Reversible and Convertible Planing Mill Exhauster, Design 6
261 Pneumatic Dust Collecting and Conveying Systems
234. Steel Plate Blowers and Exhausters
252. Steel Plate Fan, Performance Charts

Power Apparatus

239. Vertical Single Cylinder Steam Engines
256. Steam Turbines
264. Electrical Apparatus
217. Type "D" D. C. Motors
239. Steam Engine Generating Sets
255. Gasoline Electric Generating Sets
256. Steam Turbine Generating Sets
150. Fuel Economizers
223. Fuel Economizers in Textile Mills

Pressure Apparatus

257. Positive Pressure Blowers
258 Design 4 and 5 Pressure Blowers
265. Steel Pressure Blowers
242. Monogram Blowers and Exhausters

Miscellaneous

195. General Catalog
250. Architects' and Engineers' Data Book. Carefully prepared, giving full technical information usually required. Contains 960 pages of invaluable information covering heating and ventilating. Price $10.00.

STURTEVANT MILL COMPANY

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Peoples Gas Bldg

PITTSBURGH
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ATLANTA
Healey Bldg

DENVER
Colorado Bldg

Cable Address: "EMERYSTONE," Boston Lieber, Western Union and Private Codes

PRODUCTS

Crushing, Pulverizing, Grinding, Screening, Sampling, Elevating, Conveying and Mixing Machinery, also complete Plants (using above types of machinery) Designed, Equipped, Supervised, Erected and Operated.

CRUSHERS

Jaw Type For Coarse, Intermediate and Fine Crushing, Plate Steel, Cast Steel and Cast Iron construction Blake, Dodge and Cam and Roll actions Sizes: 2" x 6" to 12" x 26".

CIRCULAR NO 62

Rotary Type For the fine reduction of soft and moderately hard materials, such as Lime, Gypsum, Talc, Soapstone, Clay, Coal, Caustic Soda, Salt, etc Open Door, accessible construction, Hand Wheel adjustment, Crushes from 8" to ¼" or coarser if desired

CIRCULAR NO 63

SPECIFICATIONS ROTARY TYPE CRUSHERS

No	00	0	1	1½	2
†Hopper Opening in Inches	6 x 18	9 x 18	6 x 19	10 x 28	19 x 30
**Capacity Tons per Hour	1-1½	1-2	2-4	5-7	8-10
Approximate Horse Power	1-2	3-4	6-10	15	15-20
Speed Rev	300	250	300	200	250
Pulley	12 x 4	18 x 6	24 x 8	30 x 10	30 x 12
Length	3' 9"	4' 7"	6' 4"	7' 3"	8' 8"
Width	2' 5"	2' 4"	3' 6"	3' 6"	3' 10"
Height	3' 5"	3' 7"	5'	6'	7' 1"
Approximate Net Weight Lbs	900	1300	4000	6000	9000
Approx Gross Weight Lbs	1050	1600	4700	7000	10500

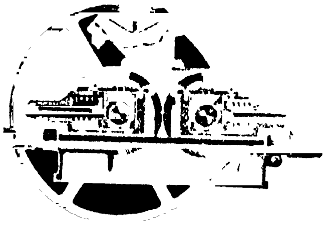
Smallest dimension given means largest CUBES the crusher will take

†These approximate dimensions do not mean the size rock the machine can grip

**Capacities based on ¼" setting and will necessarily vary according to material being crushed, its friability, specific gravity, moisture content and size of feed

ROLLS

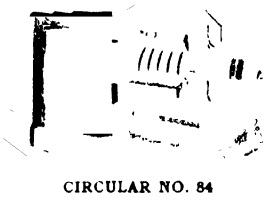
For Crushing, Granulating and Pulverizing Balanced construction Springs back of all four bearings give instant relief under breaking pressures Shocks quartered Automatic adjustments Sizes 8" x 5" to 38" x 16"


CIRCULAR NO. 65

PULVERIZERS

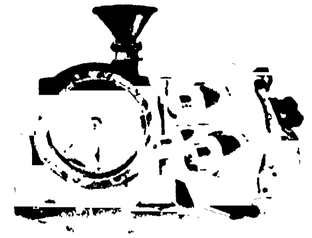
Swing-Sledge, and Hinged-Hammer for pulverizing soft and moderately hard materials such as Limestone, Lime, Shells, Chemicals Talc, Clay, Chalk, Bark, Rosin, Sulphur, Salt, Coal, Tankage, Fish, etc

Range of output from 1" to 20 mesh and finer.


CIRCULAR NO. 84

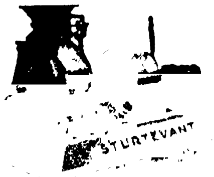
RING-ROLL MILLS

For grinding hard, medium or soft materials from 2" to from 10 to 100 mesh For grinding cement-clinker, limestone, ores, granite, trap, phosphate, clay, shale, iron-borings, feldspar, etc Slow-speed, durable and accessible No internal screens Large capacity per horse-power and low upkeep Five sizes: Capacities from 1 to 25 tons per hour


CIRCULAR NO 79

EMERY MILLS

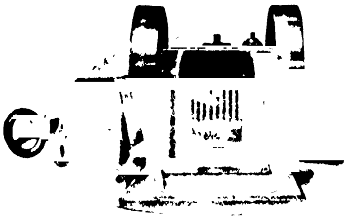
For the fine grinding of Talc, Soapstone, Gypsum, Lime, Facings, Colors, Graphite, Clay, Shale, Coal and most soft and moderately hard substances to a fine powder without the use of screens


CIRCULAR NO. 64

LABORATORY CRUSHERS

For crushing any Rock or Ore from 1" to 3" size to cracked corn size and finer. Easy to clean, require from 1 to 2 h p Capacities from 100 to 600 lbs per hour. Two sizes, jaw openings, 2" x 4" and 2" x 6" Also larger sizes, 4" x 8" and 5" x 10"

Used extensively in laboratories, assayers' offices, mining schools, steel mills, etc

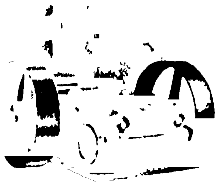

CIRCULAR NO 67

SPECIFICATIONS LABORATORY ROLL JAW FINE CRUSHERS

Jaw Opening Inches	2 x 6
Approx Capacity Per Hour	
Jaws Set to ⅛ inch	250 to 350 lbs
Jaws Set to ¼ inch	350 to 600 lbs
Approx Horse Power	1
Speed R P M	350
Pulley Inches	18 x 3½
Length Over All	2' 9½"
Width Over All	1' 10"
Height Over All	1' 10"
Approx Weight Heaviest Piece	300 lbs
Approx Net Weight	900 lbs
Approx Gross Weight	1000 lbs

LABORATORY CRUSHING ROLLS

Crush hard or soft rocks and ores from ½" to 8 mesh or even as fine as 40 mesh. Usually installed to reduce crusher outputs finer Two sizes, 8" x 5" and 12" x 12". Capacities from 200 lbs to 1 ton per hour. Immediately accessible for cleaning Automatic adjustments.


CIRCULAR NO. 67

SPECIFICATIONS LABORATORY CRUSHING ROLLS

Size In	Pulley In.	Speed R P.M	Approx Horse Power	Approx Length	Approx Width	Approx. Height	Approx Net Weight lbs	Approx Gross Weight lbs
8 x 5	18 x 4	150	1	33"	29"	22"	650	700
12 x 12	36 x 6	150	3 to 4	4'	4'8"	3'2"	3000	3500

Continued on Next Page

SAMPLE GRINDERS

For the fine grinding of rock and ore samples Pulverizes to 80 or 100 mesh or coarser Open door construction for accessibility and thorough cleaning. Capacity from 50 to 200 lbs per hour. Power, 3 h p

CIRCULAR NO. 67

SPECIFICATIONS LABORATORY SAMPLE GRINDERS

Size	Grinding Plate Diameter	Approx Length	Approx Width	Approx Height	Approx Horse Power	Pulley	Speed R P M	Approx Net Weight lbs	Gross
No 2	10"	32"	16"	14½"	3	7 x 3	750	175	200
No 0	6"	30"	12"	11¾"	2	6x 2¾	1200	150	175

AUTOMATIC COAL CRUSHER AND SAMPLER

For crushing and automatically sampling coal preparatory to analysis Takes coal 3" in size, crushes it to ¼" and finer, and at the same time automatically removes 5, 10, or 15% of the amount passing through. This sample is an accurate representation of the whole and is ready for the chemist to analyze Used by large power plants which buy coal on a B T U basis

CIRCULAR NO 85

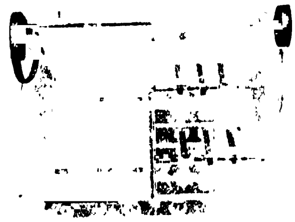
SPECIFICATIONS AUTOMATIC COAL CRUSHER AND SAMPLER

No	Hopper Opening	Approx Cap Coal Tons per Hour	Approx Horse Power	Speed R P M	Pulley	Length	Width	Height	Approx weight lbs Net	Gross
00	6" x 18"	1 to 1½	1 to 2	300	12 x 4	3' 9"	2' 4½"	3' 5"	900	1050
WITH MOTOR										
00	6" x 18"	1 to 1½	1 to 2			3' 9½"	2' 4½"	3' 5"	1300	1500

SCREENS

Sturtevant-Newaygo Super-Screen—For screening everything screenable, from ½" to 180 mesh An inclined vibrating Screen of Unit Construction

Screen frames set at 45° angle. Automatically stretched clothing, vibrated by series of hammer blows upon elastic steel bridges, placed above wire cloth and forming part of the screen frame Nothing comes in contact with the wire cloth except material being screened.



CIRCULAR NO 77

AIR SEPARATORS

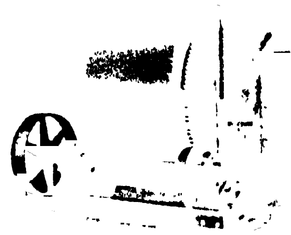
For separating Mill Products. Built in many sizes. For 60 mesh or finer work.

CIRCULAR NO. 87

DRY MIXERS

For mixing fertilizer and other dry ingredients in batches from ¼ to 1 ton Capacities from 4 to 30 tons per hour

A simple and durable machine that accomplishes a thorough and rapid mixing



CIRCULAR NO 80

SPECIFICATIONS DRY MIXERS

Size Batch	¼ ton	1 ton
Drum Capacity	25 cu ft	116 cu ft
Height with Hopper	8' 0"	12' 0"
Length with Hopper	7' 6"	12' 0"
Height without Hopper	5' 0"	7' 1"
Length without Hopper	5' 4¾"	8' 3"
Width	5' 0¾"	7' 7¼"
Pulley	24 x 4	30 x 8
Speed	120	75
Power	3 to 5	5 to 10
Capacity Tons per Hr	4 to 5	20 to 30
Weight		
With Hopper	2900	7840
Without Hopper	2600	7300

"OPEN-DOOR" STEEL ELEVATORS

"Open-Door" elevators for use with crushing, grinding and screening machinery or for many other purposes "Open door" construction insures instant accessibility for cleaning, adjustment and repair Dustless and fireproof, of strong, rugged design, and of ample proportions to withstand hard and constant use Removable sections, split head, automatic take ups, etc

COMPLETE UNITS

Ready to erect Consisting of above or similar machinery, with all connections, transmissions, bins, valves, etc.

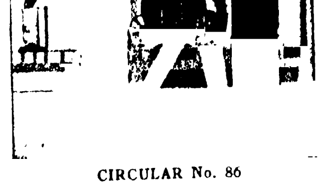
CIRCULAR NO. 61

COMPLETE FERTILIZER PLANT UNITS

For Grinding Rock, Tankage, Bone, Etc For Mixing, Shipping, Unloading, and Handling

Consists of elevators, mixer, pulverizer, screen, scales, chutes, feeders—complete, ready to set up All-steel construction, practically dustless and fireproof

All parts are designed to allow instant accessibility for cleaning.

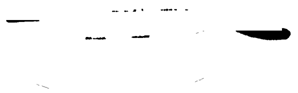


CIRCULAR No. 86

AUXILIARIES

Chutes, Spouts, Bins, Hoppers, Feeders, Valves Scales, Connections, Transmission, Etc.

CIRCULAR No. 61



CIRCULAR No. 61

SULLIVAN MACHINERY COMPANY

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Spokane
St Louis

San Francisco
Sydney, N S W
Tokyo
Toronto
Tunis
Turin
Vancouver

WORKS
Claremont N H
Chicago Ill

PRODUCTS

Air lift pumping systems for acids, chemical solutions, well water supply, etc.; Air Compressors, Mining and Quarrying Machinery; Rock Drills, Hammer Drills; Dry Vacuum Pumps; Gasoline Extraction Compressors.

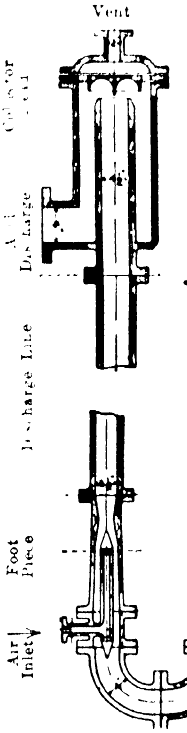
AIR LIFT PUMPING SYSTEM

The Air Lift Department of this Company consists of a corps of engineers whose experience in solving problems of pneumatic pumping covers a range of twenty-eight years of manufacture and installation Correspondence is solicited. (Catalog 71D)

General Advantages:

The general advantages of air lift pumping are

1. Simplicity and durability, no moving parts in the liquid
2. Any number of pumps controlled from one central power plant
3. Economy of power secured on high lifts by compound or stage pumping
4. Liquids carried horizontally as well as vertically
5. Pumps are not affected by mud or sand
6. Temperature of water is reduced.
7. Impurities readily removed and water rendered more susceptible to "Softening" treatment.



ACID AIR LIFT

ACID INTAKE

Some of the 120 Sullivan Acid Air Lifts at plant of Air Nitrates Corporation, Muscle Shoals, Alabama

Advantages for Acid Pumping:

1. **Durability**—The foot pieces and separator heads may be made of any desired acid resisting material, such as hard or soft lead, rubber, cast iron or cast steel, "duriron," etc There are no moving parts to cause wear, and the free open passage characteristic of this apparatus secures a much longer life than that enjoyed by mechanical pumps.

2. **Flexibility**—The normal delivery may be increased as much as twenty-five per cent. or decreased by the same amount with very little change in operating efficiency, by the movement of a valve controlling the air supply

3. **Submergence**—The air-lift is usually thought of as suitable only for deep wells, but with improved apparatus, and careful engineering, excellent results in overall efficiency are being shown on relatively low submergences In cases not permitting wells or holes to be drilled to secure the necessary submergence, the compound lift may be employed (See illustration above)

4. **Central Power Supply**—The air-lift foot pieces or jets may be located at any desired point in the plant and operated by air from a central station with little loss in friction and no loss such as that of condensation or drop in power, as is experienced with steam or electric transmission The tower men readily control the volume pumped from each unit, as well as the starting or stopping of it, by means of air valves.

5. **Efficiency**—The equipment and system employed by this company in its air lift apparatus secures the thorough mixing of the air and the fluid to be raised, by means of a large number of fine jets of air, discharging into a thin sheet of the fluid While its efficiency may be exceeded by mechanical pumps under test conditions, it is found, in actual practice, that the air-lift maintains its efficiency at a higher point, after a short period of operation

6. **Safety**—The separator head furnished by this company conveys away the fumes or air impregnated by the acid, so that the employees are not exposed to this dangerous element

SULLIVAN AIR LIFT PUMP WITH UMBRELLA SEPARATOR FOR WATER PUMPING

If interested in pumps for handling brine, acid or other chemical solutions, send us the following information:

1 Temperature of liquid 2 Specific gravity of liquid 3 Material of which the pump should be made 4 Kind of acid or solution to be pumped 5 Lift in feet 6 Submergence in feet 7. Pounds per minute to be pumped

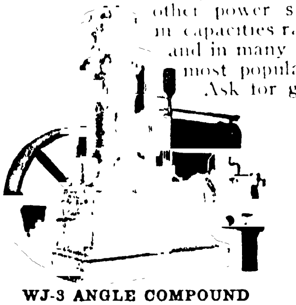
DISPLACEMENT PUMPS

Displacement pumps are also available, when low submergence renders this method of handling liquids by compressed air desirable.

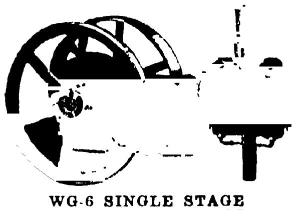
An important feature of these Sullivan pumps is the automatic control, so arranged that working parts do not come in contact with the liquid being pumped.

AIR COMPRESSORS

Sullivan Air Compressors, for operating air lift and for other power supply purposes, are available in capacities ranging from 50 to 3000 cu. ft, and in many standard patterns Two of the most popular are shown here Ask for general booklet No 121.



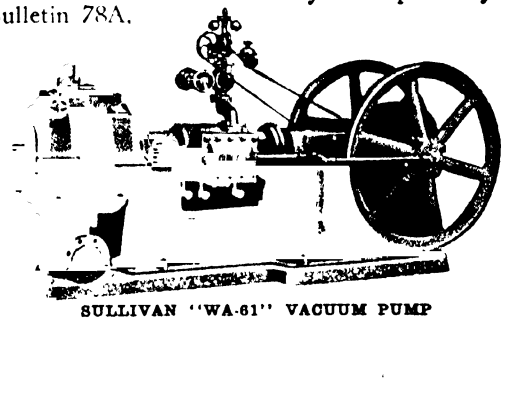
WJ-3 ANGLE COMPOUND COMPRESSOR



WG-6 SINGLE STAGE BELTED COMPRESSOR

SULLIVAN DRY VACUUM PUMPS

Sullivan steam- and belt-driven dry vacuum pumps are available in a number of convenient sizes. They are equipped with Sullivan Wafer Valves on the vacuum cylinders, and all main working parts are fully enclosed and are lubricated by the splash system. Bulletin 78A.



SULLIVAN "WA-61" VACUUM PUMP

THE SUPERHEATER CO.

Designing Engineers and Manufacturers of Elesco Steam Superheaters and Pipe Coils for All Purposes

GENERAL OFFICES: 17 EAST 42ND ST., NEW YORK, N. Y.

Chicago, Peoples Gas Bldg Pittsburgh Oliver Bldg

PRODUCTS

"Elesco" Superheaters for all types and sizes of Stationary Boilers; separately fired superheaters for all purposes; superheaters for locomotives and steam shovels; superheaters for marine service: Pipe coils for all purposes.

ENGINEERING SERVICE

The Engineering Department of this company is at the service of those interested in the advantages or application of Superheated Steam.

ELESCO SUPERHEATERS

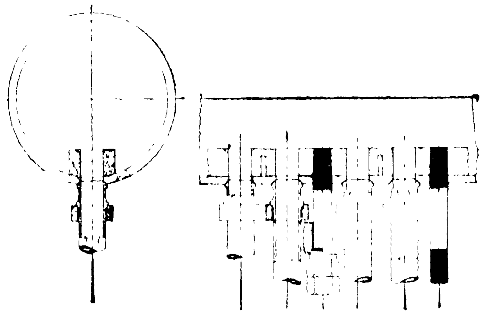


FIG. 1—BALL JOINT CONNECTION BETWEEN UNITS AND HEADER

Elesco Superheaters are suitable for all types of boilers without changes to the boiler setting. They reduce fuel consumption, increase boiler efficiency, reduce condensation in steam lines, reduce steam consumption in engines and turbines, increase the capacity of the plant.

Their design and construction provides freedom from leaks, ease of application, and accessibility for inspection and repairs, and maximum length of service without renewal.

The Elesco Superheater consists in general of two headers, one acting as the distributor for the saturated steam, coming from the boiler, and the other as a "Superheated" header for collecting the steam after it has been superheated, and the necessary connecting units in which the actual superheating takes place. The headers are made of steel and located out of the path of the hot gases, and in most cases, outside of the boiler setting proper, affording easy access for inspection and cleaning

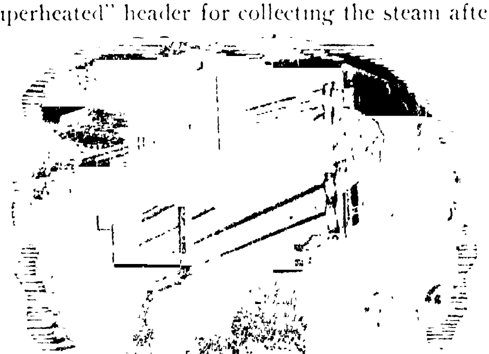


FIG. 2—TYPICAL INSTALLATION ELESCO SUPERHEATER

Units are of heavy cold drawn seamless steel tubing located in the advantageous gas temperatures, giving a large ratio of superheating surface, an even distribution to the flow of the gases, and a proper distribution to the steam through the superheater The units present a smooth surface to the gases, tending to prevent an accumulation of soot and ashes, and are thus easily cleaned. Because of their small diameter and proper distribution they offer a minimum obstruction to the gases.

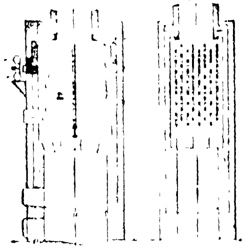


FIG. 3—SEPARATELY FIRED SUPERHEATER

A metal to metal ball joint forms the connection between the units and the headers, giving a positive tight joint, and avoids the use of hand holes and gaskets.

SEPARATELY FIRED SUPERHEATERS

This company designs and manufactures separately fired superheaters, for all purposes and for process work, for pressures from atmospheric up to 1000 lbs. per sq in. and for temperatures up to 1000° F. The special features of accessibility, regulation, long life and high efficiency are incorporated in these designs.

SUPERHEATERS FOR STEAM SHOVELS

Elesco Superheaters, easily installed in steam shovels, reduce fuel consumption at least 25%. At least as high a saving in water is also possible

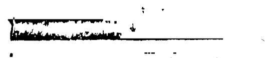


FIG. 4—SECTIONAL VIEW OF PATENTED FORGED RETURN BEND

ELESCO PIPE COILS

The coils are designed and manufactured to practically any specifications, for any purpose. The feature of these coils involving a return bend is the patented forged return bend which results in a coil of practically a continuous pipe, without threaded or acetylene welded joints; greatest surface within a given space possible; absolutely leak proof.

Full Descriptive Literature on all "Elesco" Products.

THE SURFACE COMBUSTION COMPANY

Industrial Furnace Engineers and Manufacturers

THE SURFACE COMBUSTION CO.

GENERAL OFFICES AND WORKS
366-368 Gerard Ave., Bronx
NEW YORK, N. Y.
BRANCH OFFICES

THE SURFACE COMBUSTION CO.

Philadelphia, 61[illegible] Pennsylvania Building
Pittsburgh, Union Arcade
Chicago, 305 South La Salle Street

PRODUCTS

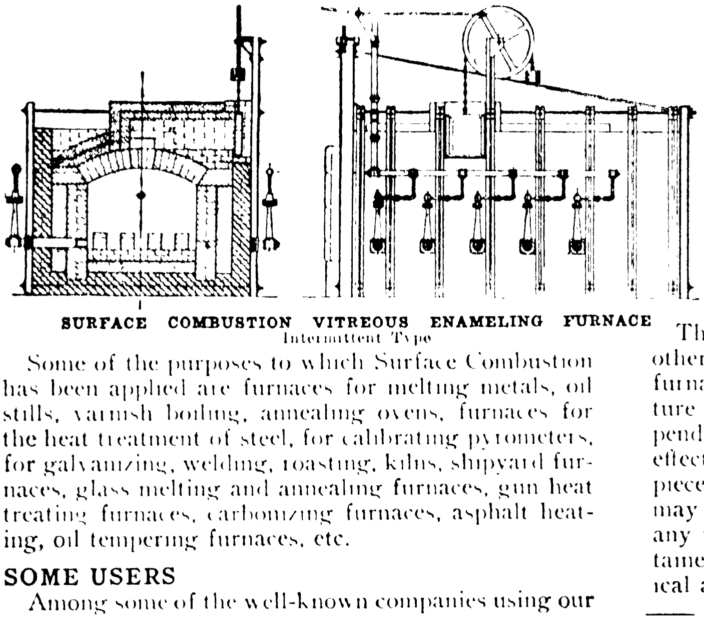
Surface Combustion Apparatus, Ratiometers, for all Types of Industrial Furnaces and Heating Equipment consuming gas or oil as fuel.

MEDAL OF MERIT

Edward Longstreth Medal of Merit awarded by Franklin Institute for the Surface Combustion Gas and Air Proportioning System.

APPLICATIONS

Surface Combustion is the ideal method of heating based on a thorough study of the fundamental and theoretical principles of combustion and carried into effect by the design of efficient and economical apparatus for the purpose. The process and apparatus are fully covered by U. S. Letters Patents and applications for U. S. Letter Patents.



SURFACE COMBUSTION VITREOUS ENAMELING FURNACE
Intermittent Type

Some of the purposes to which Surface Combustion has been applied are furnaces for melting metals, oil stills, varnish boiling, annealing ovens, furnaces for the heat treatment of steel, for calibrating pyrometers, for galvanizing, welding, roasting, kilns, shipyard furnaces, glass melting and annealing furnaces, gun heat treating furnaces, carbonizing furnaces, asphalt heating, oil tempering furnaces, etc.

SOME USERS

Among some of the well-known companies using our equipment might be mentioned

E I du Pont de Nemours Co
General Electric Co
Macbeth Evans Glass Co
U S Steel Corp
International Coal Products Corp
Walworth Mfg Co
Bethlehem Steel Co
U S Rubber Co
Watertown Arsenal
Standard Oil Co
Babcock & Wilcox Co
General Petroleum Corp
The Pusey & Jones Co
Hyatt Bearings Division General Motors Corp
Valentine Varnish Co
Crane Co
U S Aluminum Co of America
U S Naval Ordnance Plant, W Va

THE PRINCIPLE

Surface Combustion is a process of burning gaseous fuel homogeneously pre-mixed with sufficient air to form an explosive mixture, even to the point where the fuel is completely burned and no free oxygen left; the burning yielding in every case products of combustion at their highest temperature which make possible the development of a maximum amount of heat in the form of radiant energy.

Surface Combustion brings into play the accelerating influence on combustion of hot surfaces, their influence allowing a far greater volume of fuel to be burned in a given space than could otherwise be done.

WHAT SURFACE COMBUSTION ACCOMPLISHES

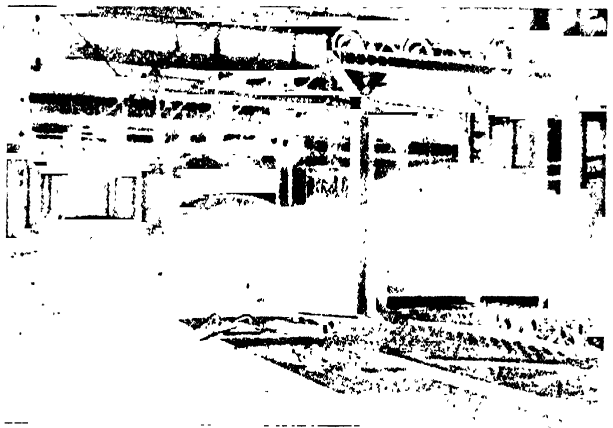
When a fuel is burned with a 100% generation efficiency, as is evidenced by no free O or CO in the resultant products, and when such generation develops the maximum amount of heat as radiant energy and concentrated products at their maximum temperature, so that absorption by radiation and convection is at its highest point of efficiency, then certainly the acme of heating perfection, by combustion methods, is obtained. Surface Combustion makes this possible.

THE APPARATUS

The component parts of a typical Surface Combustion appliance may be listed as follows:

(1) Furnace,
(2) Burners,
(3) Proportioning Devices,
(4) Equipment for delivery of gas and air.

(1) **Furnaces:**—The foundations, metalwork, brickwork and insulation of Surface Combustion furnaces do not differ widely from the approved designs for furnaces employing other systems of combustion. The refractory differs, however, from that in use in other furnaces. In one type of Surface Combustion furnaces refractory is used as a bed in which the mixture is burned. The burner and the bed are interdependent, the combination of the two producing the effects outlined. In some cases the bed may be solid pieces of refractory of suitable shape and size, or it may be made up of loose broken refractory. Almost any refractory which will stand the temperatures obtained and at the same time possess the necessary physical and chemical properties can be used.



SURFACE COMBUSTION FORGE AND PLATE AND ANGLE

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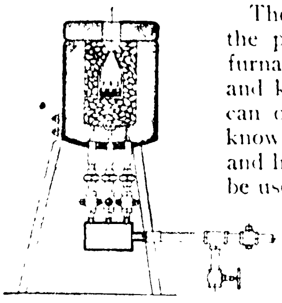


SURFACE COMBUSTION CONE FUSION FURNACE FOR VERY HIGH TEMPERATURE TESTING

The method of determining the proper type and size of a furnace to do a given amount and kind of work is one which can only be learned through a knowledge of the possibilities and limitations of the process to be used. There is no element in this which is peculiar to Surface Combustion We are, however, prepared to study the requirements of your process and design for you suitable furnaces embodying the advantages of the Surface Combustion process.

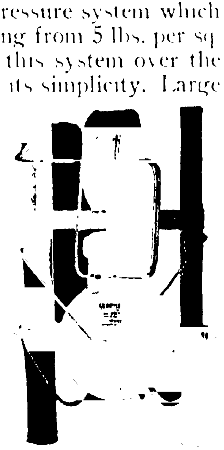
(2) **Burners:**—The burners used in Surface Combustion equipment are the result of a careful study of the requirements of our process. They are of what is called the impact, tunnel, expanding jet, opposed jet, etc., which localize the combustion.

It was found early in the development of Surface Combustion that the nozzle or tip of the burner, if to operate successfully at all burner pressures, must be kept cool. This feature has been provided for, without resorting to water cooling with its many disadvantages, by means of an arrangement of fins whereby the heat is drawn back from the burner and absorbed by the surrounding air. This arrangement has proved entirely successful in all of our numerous installations.

(3) **Proportioning Devices:**—All Surface Combustion installations include a proportioning device which guarantees (1) the delivery of a properly proportioned mixture, (2) the delivery of a homogeneous mixture, and (3) the control of such a mixture located in a single valve.

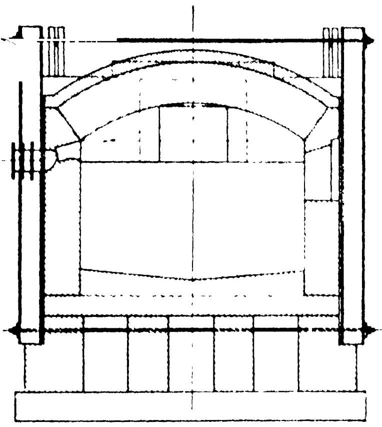
We ordinarily employ one of two proportioning devices: (1) the low pressure system which utilizes gas at from two to six inches water pressure and air under a pressure varying from ¼ lb. per sq. in. to approximately 1 lb. per sq. in. This system is used mainly on small appliances; (2) the high pressure system which utilizes gas under pressure, ranging from 5 lbs. per sq in. upward. The advantages of this system over the low pressure system lie mainly in its simplicity. Large quantities of gas can be handled in small pipes. It is also a one-pipe system which always has advantages over a two-pipe system, such as is the low pressure system Where high pressure gas is available, direct from the gas mains, it is the most economical system that could be used, as it eliminates all motors, blowers and air piping and cuts down the size of the gas piping to a minimum.

Where high pressure gas is not available, direct from gas mains, a suitable gas booster may be installed designed to give the necessary maximum capacity at a 10-lb. pressure.



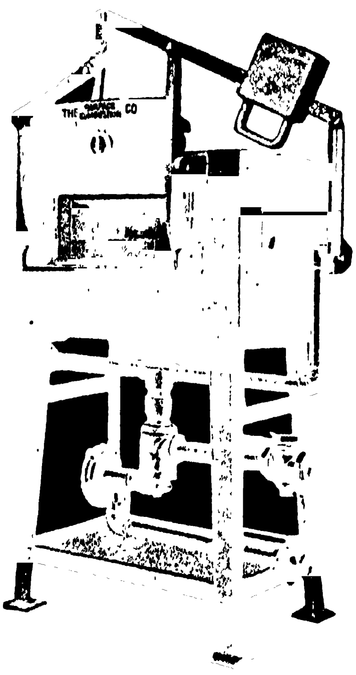
THE RATIOMETER

Automatically maintains correct combustion in gas fired furnaces Can be applied to any two valve type of furnace



SURFACE COMBUSTION DAY TANK FOR MELTING GLASS

(4) **Equipment for the Delivery of Air and Gas:**—It would take a great deal of time to go into detail regarding the equipment covered under this heading. As before explained, almost numberless combinations are met with and must be considered and understood. Roughly, apparatus for delivering gas and air may be divided into four classes: (1) fans, (2) positive pressure blowers or boosters, as the gas blowers are called, (3) mixing compressors, (4) compressors.



SURFACE COMBUSTION FURNACE FOR ANNEALING AND HARDENING

All these machines can be used with Surface Combustion and it is felt that no one, two, three or a dozen machines can be picked to fit the various conditions arising. It is our practise to select the best machine for a given condition. For driving the above machines electricity, steam, or any form of power may be used.

CONSULTING SERVICE

It is our aim on these pages to give an idea of what Surface Combustion is and the extent to which it can be applied in the chemical and allied industries.

If your manufacturing processes are such as to involve heating of furnaces, stills, dryers, roasters, ovens, kilns or other equipment, marked economies can be effected by the introduction of Surface Combustion equipment.

In many cases this will not involve the entire discarding of your present equipment. We can often redesign your present furnace or other equipment so as to introduce Surface Combustion with but slight modification of your plant as it now stands.

SWENSON EVAPORATOR COMPANY

Main Office, 915 Monadnock Building

CHICAGO, ILLINOIS

Cable Address
"EVAPORATOR" Chicago
Western Union Code

EASTERN OFFICES
519 Widener Building, Philadelphia, Pa
30 Church Street, New York, N Y

PRODUCTS

Various types of Evaporators, Single and Multiple Effect; Vacuum Pans; Leaching Batteries; Causticizing Equipment; Beet Sugar Machinery; Pulp Mill Machinery; Special Chemical and Waste Product Machinery; Condensers; Heaters; Continuous Crystallizers.

MATERIALS HANDLED IN EVAPORATORS

The following is a partial list of the materials that our machines are actually concentrating in a satisfactory manner

Aluminum Sulphate
Ammonium Chloride
Beef Extract
Bittern
Black Liquor
Calcium Acetate
Calcium Chloride
Caustic Soda
Distilled Water
Fertilizers
Fish Water
Fruit Juices
Garbage Water
Gelatine
Glucose
Glue
Glycerine
Iron Sulphate
Magnesium Chloride
Malt Extract
Mercerizing Waste
Milk Whey
Molasses Waste
Pepsin
Potash
Potassium Sulphate
Salt
Sodium Benzo Sulphonate
Sodium Carbonate
Sodium Nitrate
Sodium Sulphate
Sorghum Sirup
Steep Water
Steffens Water
Sugar
Sulphite Water
Tankwater
Tannin Extract
Tartaric Acid
Tobacco Extract
Tomato Pulp
Twitchell Water
Western Lake Waters
Zinc Chloride
Zinc Sulphate

INDUSTRIAL EVAPORATION

The scope of industrial evaporation is somewhat larger than is ordinarily recognized. A constantly growing number of chemical and other manufacturing processes require the removal of water from dilute solutions, and this evaporation work is an important and indispensable part of such processes.

The above list may be accepted as representative of a growing number of industries using evaporating plants either for intermediate products, main products, or by-products.

As an illustration of the magnitude of the work done by Swenson Evaporators, we figure that when all our installations are running at full load, 24 hours per day, there would be a total evaporation of **32,000,000 gallons of water per day.**

RANGE OF SIZES

Swenson Evaporators are built in sizes ranging from 100 to 20,000 gallons per hour evaporation

TYPES OF EVAPORATORS

Standard Swenson Type

Swenson Basket Type

Standard Vertical Tube Pans

Swenson Type K—Semi-Film

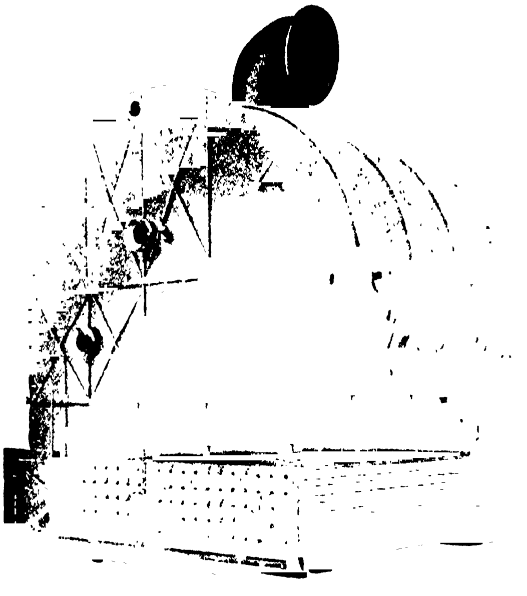
Swenson High Concentration Type

Special Types -to meet exceptional demands and produce unusual results.

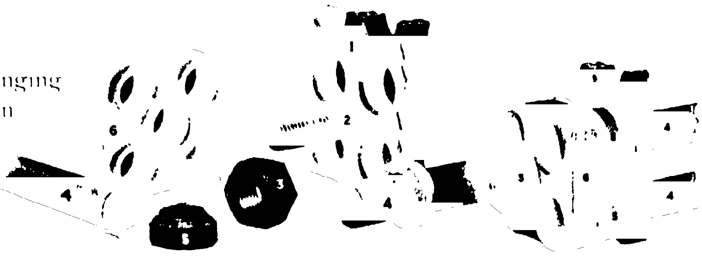
SWENSON STANDARD HORIZONTAL TUBE EVAPORATORS

The type of evaporators that seems to be most adaptable to extensive use is our Standard Swenson Horizontal Tube Type. It is natural that this should be so because of its simplicity.

Our Standard Swenson is a rectangular shaped evaporator with horizontal tubes located near the bottom of each effect. It is made up in sections of heavy cast iron plates with machined and drilled faces and flanges. The assembled castings are bolted together with suitable packing material (usually sheet asbestos) making a vacuum tight joint.



STANDARD SWENSON HORIZONTAL TUBE TYPE SHOWING BRACING AND TUBE ARRANGEMENT



DETAIL OF TUBE PACKING

(1) Section of tube plate Cast as a part of steam chest of Standard Swenson
(2) Packing plate stud
(3) Nut for packing plate stud
(4) Tubes (heating surface)
(5) Standard tube gasket (made for ¾", ⅞" and 1¼" O D tubes). Taper side of gasket goes next to tube plate
(6) Standard 4 hole Swenson packing plate Also made for 6 and 8 tubes

Continued on Next Page

There is a steam chest at each end cast as an integral part of the vertical tube sheets Each tube passes through both tube sheets and is packed by standard Swenson packing plates and rubber gaskets This scheme of packing has proved a great source of satisfaction to our customers for many years It combines vacuum tightness and resistance to high temperature with great ease of removal

One of the most important features of the Standard Swenson is the readiness with which transportation and erection can be effected

This type of evaporator requires small headroom (in most cases only 12 feet) and as it is shipped in sections, can be taken into a building through an ordinary door

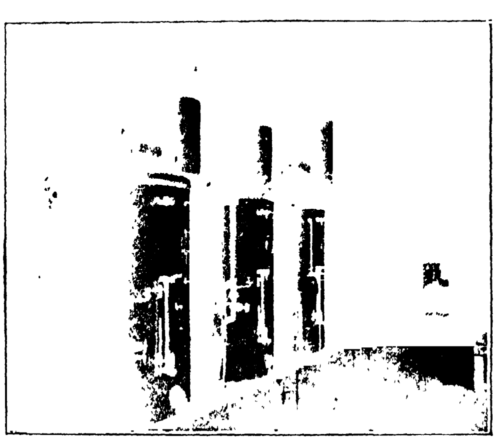
This sectional construction is also an advantage when export shipment must be made as the relatively small weight of our boxes (we box completely with heavy lumber and with very few exceptions, no box weighs over 4,000 lbs) and their compactness gives our clients the benefit of minimum ocean freight rates and minimum handling charges, and also permits of transportation and handling in places where heavier and larger boxes could not be used

SIZES

We have patterns for sizes ranging from our small semi-commercial research laboratory size to our large units capable of handling upwards of 20,000 gallons per hour Our designs and patterns are very complete and these have been standardized so that we are in a position to furnish an evaporator for practically any capacity without making any new shop equipment Modern shop practice as regards the use of metal templates, jigs, etc , is followed wherever possible and because of our large permanent investment in patterns, templates, etc , our customers are benefited by being able to secure prompt and accurate service when repairs are needed Our evaporators are, of course, supplied for vacuum as well as low pressure service and are built as single or multiple effects, depending on the work to be done

SWENSON PATENTED BASKET TYPE

This type is made for high pressure or vacuum evaporation, single or multiple effect, and is designed for concentrating heavy liquids, scale forming liquids, or where a precipitation of crystals or other solids occurs. A vertical tube arrangement is employed



SWENSON PATENTED BASKET TYPE TRIPLE EFFECT

Cast iron, steel, pure iron or copper bodies, steel, pure iron or copper steam basket, vertical tubes, condenser, vacuum, condensation and liquor pumps

The chief advantages of the Basket Type are flexibility in capacity, adaptability to relatively heavy solutions, method of steam and liquor circulation, and ease of scale removal

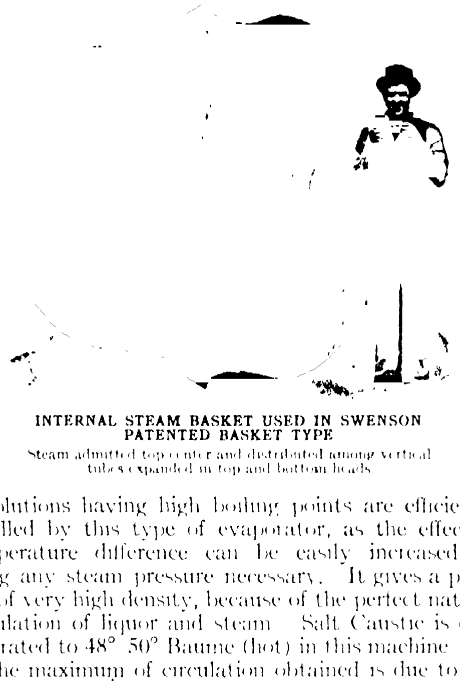
The chief feature of the basket type is the internal steam basket Steam is admitted at the top center and distributed among the vertical tubes, which are expanded in the top and bottom of the basket

The use of this basket suspended in the center of the body of the evaporator brings about a maximum circulation of the boiling liquor The annular downtake space has an area more than sufficient to handle all the descending boiling solution The entire heating element is submerged in the boiling solution so that radiation loss is reduced to a minimum

Any hard scale forming in the tubes can be removed mechanically in the same manner boiler tubes are cleaned The rapid circulation tends to keep this type of evaporator cleaner than other vertical tube machines

Where extensive repairs are needed, the basket can be removed through the top without interfering with the setting or evaporator body

When the liquid being evaporated deposits crystals, a deep cone bottom is supplied in which these crystals settle They can be discharged from these bottoms into receivers, closed salt filters, open filters or centrifugals It is a very efficient machine for a precipitating solution.



INTERNAL STEAM BASKET USED IN SWENSON PATENTED BASKET TYPE

Steam admitted top center and distributed among vertical tubes expanded in top and bottom heads

Solutions having high boiling points are efficiently handled by this type of evaporator, as the effective temperature difference can be easily increased by using any steam pressure necessary. It gives a product of very high density, because of the perfect natural circulation of liquor and steam Salt Caustic is concentrated to 48° 50° Baume (hot) in this machine

The maximum of circulation obtained is due to our patented construction, which eliminates all countercurrents in the downtake

SWENSON TYPE K SEMI-FILM

This is a newly patented type, and is an entire innovation. It is especially suitable for handling foamy liquors and has the additional advantage that it gives a very high circulation of the liquor and complete circulation of steam. It further allows the removal o non-condensable gases without loss of economy. Nc pumping of liquor.

HIGH CONCENTRATING TYPE EVAPORATOR

This type is an adaptation of the Swenson Baske type with a forced or accelerated movement of th

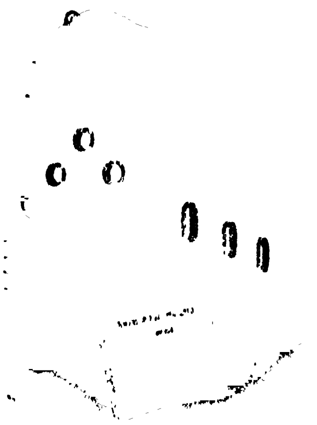
Continued on Next Pag

liquor. It will handle practically any solution, and the concentration can be carried to almost any desired density provided the solution remains fluid.

High steam pressure and high vapor pressure can be maintained. The heating tubes remain clean even with a heavy viscous liquor containing a large percentage of crystals and suspended matter. Calcium and magnesium chlorides are concentrated in this type and discharged directly into the shipping drums.

STANDARD VERTICAL TUBE TYPE

This design (for large installations) can be equipped for crystallizing solutions and also for straight concentration work. It is fitted with our patented vapor and steam device giving a perfectly uniform distribution of vapor to all tubes, by this means increasing the amount of work possible with a given tube area.



SPECIAL LEAD EVAPORATOR

SPECIAL TYPES

The Swenson Evaporator Company by no means confines itself to the standard types of evaporators. On the contrary our engineers are constantly employed in converting the conventional apparatus to meet peculiar conditions and produce specific effects. Where our standard units are not adaptable we build special apparatus to more economically meet the demands.

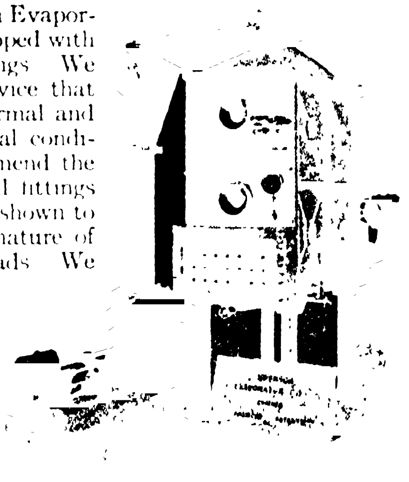
INSTALLATION

All Swenson evaporators are completely set up before shipment and thoroughly assembled by our experienced mechanics. Nothing is left to be done on the field which can be done in our shop. Consequently the time required to install one of our units is the minimum, and all parts fit closely.

Every Swenson evaporator is complete and ready to run when set up on foundations provided by the customer and connected to customer's pipe lines. We make a special feature of the location of every fitting so as to have them accessible and convenient for all purposes.

AUXILIARIES AND FITTINGS

We have given the most careful study to the selection and development of vapor piping, condensers, catchalls, salt receivers and pumps furnished as auxiliaries to our evaporators, and have developed maximum efficiency in operation, low first cost, and durability of construction.



SWENSON JUNIOR STANDARD SINGLE EFFECT

Every Swenson Evaporator is fully equipped with all necessary fittings. We supply every device that is needed for normal and also for occasional conditions, but recommend the elimination of all fittings that practice has shown to be more in the nature of ornaments or fads. We advise against the spending of money for a fitting that we know from experience will be out of service in a short time because it is not really needed.

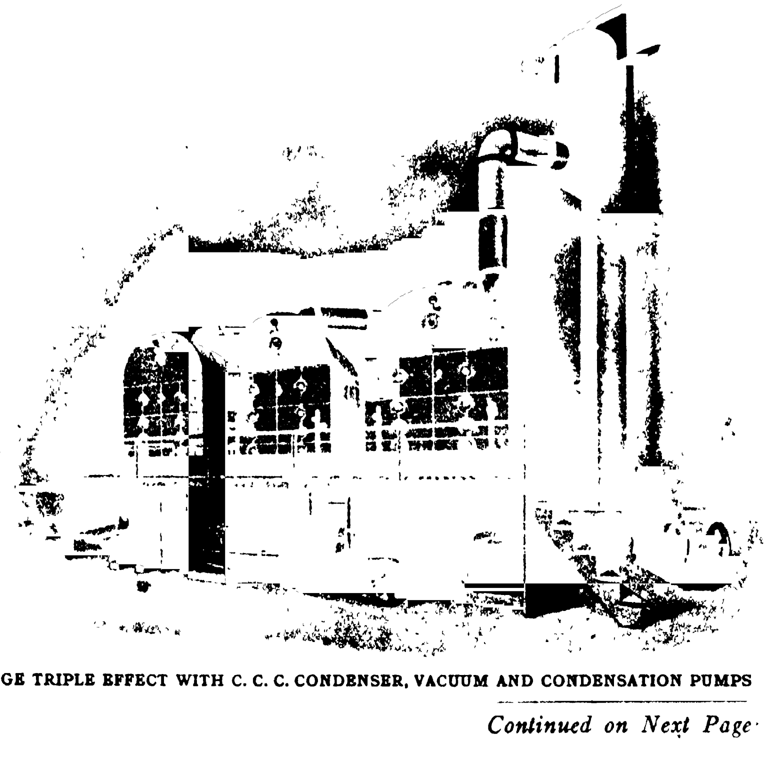
MATERIALS OF CONSTRUCTION

The majority of solutions can be handled most advantageously in evaporators having cast iron shells or bodies. There are, however, occasions when other materials of construction are necessary or desirable. In these cases, we build machines of tank steel, firebox steel, sheet copper, cast steel, pure iron, cast brass, bronze, aluminum, lead, etc.

We try to have every installation a profitable one for the customer and only offer an expensive construction when we feel that this is absolutely necessary from an investment standpoint. All of our evaporators are durable, but the materials used are determined entirely by the conditions that exist.

In all our evaporators we employ tubular heating surfaces, and these can be made of welded or seamless steel, charcoal iron, aluminum, copper, brass, lead, etc.

Auxiliary parts such as pipe, catchalls, condensers, etc., are made of those materials which in relation to first cost seem most economical in the end.



LARGE TRIPLE EFFECT WITH C. C. C. CONDENSER, VACUUM AND CONDENSATION PUMPS

Continued on Next Page

ECONOMY RATING OF EVAPORATORS*

Steam Consumption of Evaporators and Cooling Water Requirements of Condensers

**Total Evaporation U. S. Gal per Hour	§Steam Consumed Pounds per Hour				†Cooling Water to Condenser U. S. Gallons per Minute											
	Single Effect	Double Effect	Triple Effect	Quadruple Effect	Single Effect			Double Effect			Triple Effect			Quadruple Effect		
					Temp of Injection—° F			Temp of Injection—° F			Temp of Injection—° F			Temp of Injection—° F		
					60	70	80	60	70	80	60	70	80	60	70	80
100	925	465	310	230	42	52	70	21	26	35	14	17	23	11	13	18
150	1390	695	465	345	63	78	105	32	39	53	21	26	35	16	20	26
200	1850	925	620	465	84	104	140	42	52	70	28	35	47	21	26	35
300	2775	1390	925	695	126	156	210	63	78	105	42	52	70	32	39	53
400	3700	1850	1230	925	168	208	280	84	104	140	56	69	95	42	52	70
500	4625	2315	1540	1160	210	260	350	105	130	175	70	87	115	53	65	88
750	6940	3475	2315	1730	290	360	480	160	195	265	105	130	175	79	98	130
1000	9250	4630	3080	2310	390	480	640	210	260	350	140	175	235	105	130	175
1250	11560	5780	3860	2890	490	600	800	245	300	400	175	215	290	130	165	220
1500	13880	6940	4630	3470	585	720	960	295	360	480	210	260	350	160	195	265
2000	18500	9250	6170	4630	780	960	1280	390	480	640	260	320	425	210	260	350
2500	23130	11570	7710	5790	975	1200	1600	490	600	800	325	400	535	245	300	400
3000	27750	13880	9250	6940	1170	1440	1920	585	720	960	390	480	640	295	360	480
4000	37000	18500	12340	9250	1560	1920	2560	780	960	1280	520	640	855	390	480	640
5000	46250	23130	15400	11560	1950	2400	3200	975	1200	1600	650	800	1065	490	600	800
6000	55500	27750	18500	13880	2340	2880	3840	1170	1440	1920	780	960	1280	585	720	960
7000	64750	32380	21580	16190	2730	3360	4480	1365	1680	2240	910	1120	1495	685	840	1120
8000	74000	37000	24670	18500	3120	3840	5120	1560	1920	2560	1040	1280	1705	780	960	1280
9000	83250	41630	27750	20810	3510	4320	5760	1755	2160	2880	1170	1440	1920	880	1080	1440
10000	92500	46250	30840	23130	3900	4800	6400	1950	2400	3200	1300	1600	2135	975	1200	1600
12000	111000	55500	37000	27750	4680	5760	7680	2340	2880	3840	1560	1920	2560	1170	1440	1920

Compiled by the Engineers of Swenson Evaporator Co.

* Figures in this table do not represent the best performances of our evaporators and condensers, but are compiled with reasonable allowance for the fluctuations and variations of average practice. Steam and cooling water requirements will often be found less, and sometimes somewhat more, than indicated. Steam consumption, for instance, varies with different efficiencies of heat insulating covering employed, while cooling water requirements are affected by air content of the injection water, and other factors. Any data obtained from this table will be found to agree closely with data generally obtained from actual operation.

** In the case of a multiple effect figures given are for combined evaporation from all effects.

§ Amount of heating steam applied to first effect, at pressure of 3 to 5 pounds, when liquor is fed to evaporator at approximately 120 degrees F. Different steam pressure, or reasonably different temperature of feed liquor will affect figures within a few percent only.

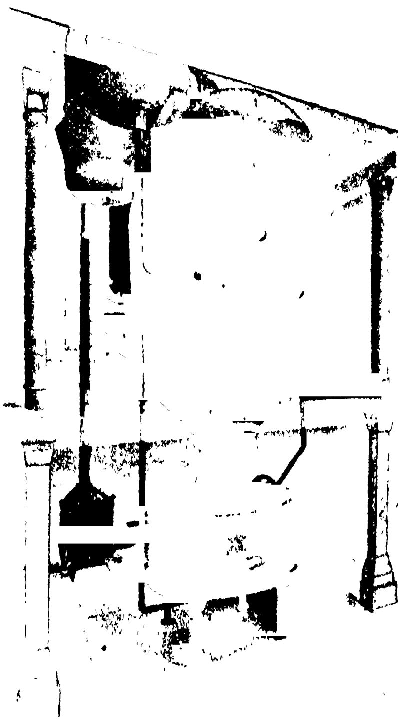
† Based on 26-inch vacuum (referred to 30-inch barometer) in last effect. Figures above heavy black line are for parallel current jet condensers, below heavy black line for counter current cataract condensers. The type of condenser usually employed is as indicated by this statement.

MULTIPLE EFFECT ECONOMY

The above table gives some figures illustrating the saving brought about by the use of a multiple effect evaporator where large quantities of water are to be boiled off. The economy both of steam and condensing water required is directly proportional to the number of effects.

SERVICE

We have a complete organization of thoroughly trained men, and are therefore in a position to give the thorough service one expects when buying an evaporator. Our records for many years can be used in designing new and special forms for special purposes.



STANDARD SWENSON SINGLE EFFECT

For glycerine, cast iron body, hopper bottom, copper horizontal tubes, catchalls, jet condenser, closed salt filter, vacuum pump

DATA REQUESTED

Please cover the following points as completely as possible, as careful attention in submitting information may save needless correspondence. All information treated strictly confidential.

1. Analysis of liquor. If not available send sample.
2. Quantity to be handled in the evaporator.
3. What will be the average initial density (specific gravity, Beaumé, Twaddell, or percentage of solids)?
4. What final density or condition is desired?
5. What is the initial temperature?
6. Are there any marked effects or changes of properties produced by temperature changes?
7. What are the boiling points at atmospheric pressure of the dilute solution and the same solution at the final state of concentration which you wish to reach?
8. State any peculiar properties such as tendency to foam, entrain, evolve gases, become viscous, deposit crystals, sludge, etc.
9. Are there any scale-forming ingredients, such as sulphate of lime, phosphate of lime, silica, etc.?
10. What steam is available for evaporation purposes, live or exhaust? Will it be necessary to install a boiler?
11. In what quantity is water available to operate a condenser? What is the source of the water and at what temperature can it be obtained? State quality of water.
12. Include any other information that might be deemed helpful.

OVER HALF OF OUR ORDERS ARE REPEAT ORDERS

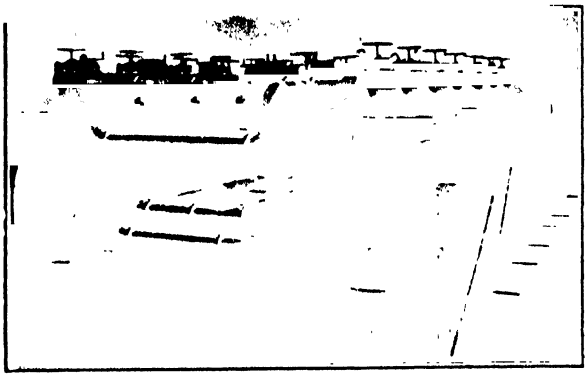
Catalog on request.

Continued on Next Page

SWENSON SUGAR MACHINERY

- **Juice Heaters and Boilers**
- **Carbonators**
- **Sulphur Burners**
- **Pre-Evaporators**
- **Multiple Effects**
- **White and Raw Sugar Pans**
- **Crystallizers**
- **Lime Kilns**
- **Diffusion Batteries**
- **Beet Wheels**
- **Beet Washers**
- **Beet Pulp Presses**

In building beet sugar machinery over a period of years we have constantly changed and improved certain machines, while others, having been tried and found satisfactory from standpoint of design and durability, remain substantially in accordance with our earlier patterns



14-CELL SWENSON BATTERY
Recently shipped to Korea to be used in conjunction with a full line of our machinery installed in an 800-ton factory

SWENSON PULP MILL MACHINERY

- **Digesters**
- **Disc Evaporators**
- **Melt Tanks**
- **Diffusers**
- **Incinerators**
- **Causticizers**
- **Evaporators**
- **Smelters**

We have developed this line of machinery for both the *soda* and *sulphate* process, and are in a position to furnish practically all the special apparatus needed in the recovery end of these industries. Our experience has been such as to insure the success of our designs in detail, both large and small Our machinery is widely used in this field and a list of our customers will be supplied on request, limited space here not permitting same.

PART OF RECLAIMING ROOM IN SULPHATE MILL
Showing Swenson Incinerators 9′ 0″ dia. x 24′ 0″ long

CONDENSERS,

We build three types of condensers:

(1) Wet System Jet Condensers

(2) Counter Current Cataract (c c c.) Dry System Condensers, and

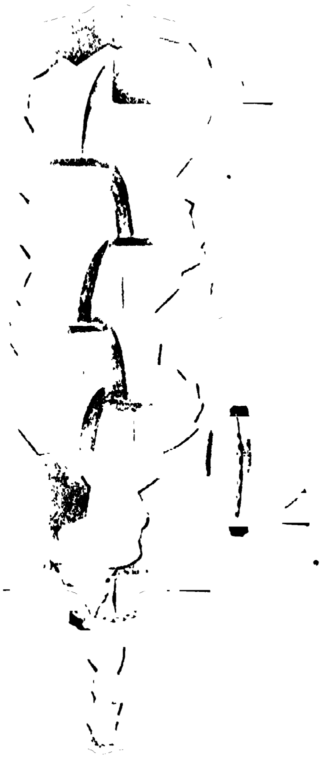
(3) Multi-pass Surface Condensers

Every evaporator equipment is given careful study and the proper type of condenser determined, depending on operating conditions

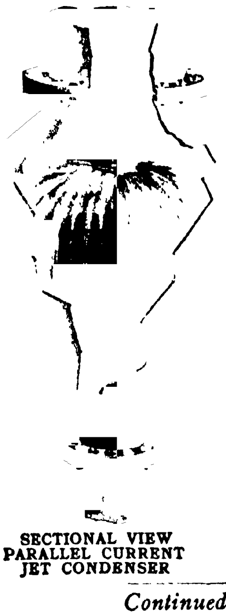
Our Jet type is cast in one piece, is very efficient, and is usually used with our smaller equipments where a high vacuum is not essential

Our c c c type is made with a steel or cast iron shell, depending on the kind of water used This type will give a very high vacuum and is economical from the standpoint of amount of water used.

Surface condensers are used only where the distillate is to be saved, or where economical use can be made of the heat that passes into the water or solution used for condensing purposes



SECTIONAL VIEW
COUNTER CURRENT CATARACT CONDENSER



SECTIONAL VIEW
PARALLEL CURRENT
JET CONDENSER

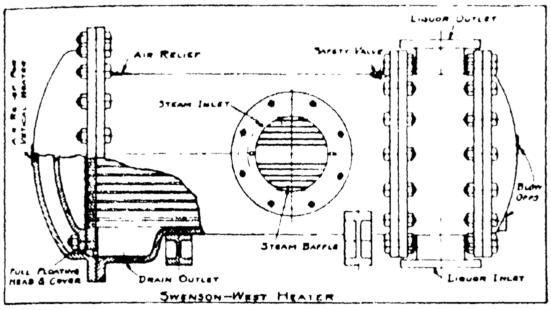
Continued on Next Page

HEATER DEPARTMENT

The Swenson-West Heaters are made for heating oils, sugar juices, boiler feed water, chemical solutions of all kinds both dilute and concentrated.

We also build heaters for domestic service in hotels, apartments, factories, office and other public buildings.

Specially designed heaters, coolers, interchangers, economizers are manufactured for either heating or cooling any liquid, including the recovery of heat from all liquid wastes

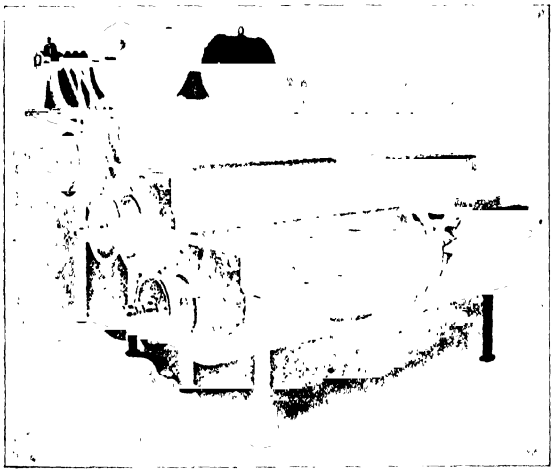


TYPICAL SWENSON-WEST HEATER

Necessary Data Required:

1. Description and characteristics of liquid to be heated or cooled
2. Quantity to be handled per hour
3. Temperature of liquid to be heated or cooled and final temperature desired
4. Temperature of heating or cooling medium

Construction Features—Shells are made from high grade close grained cast iron; tubes are copper or brass, either plain or corrugated, as conditions require, and are expanded in the heads, one of which is full floating to take care of expansion strains. Liquor channels can be made of any metal required to take care of corrosive actions of liquids.



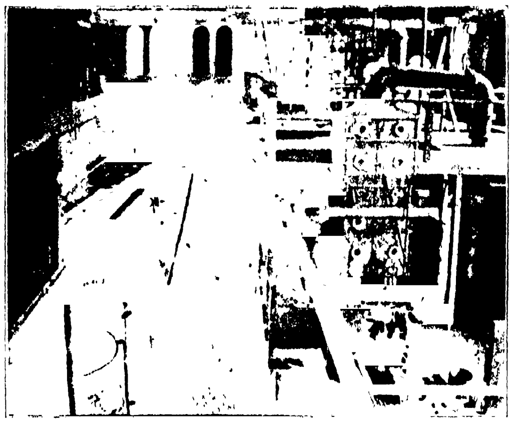
SWENSON-WALKER CRYSTALLIZER

CRYSTALLIZER DEPARTMENT

The Swenson-Walker crystallizer was devised for the continuous crystallization of salts in a saturated solution where separation takes place when the liquor is cooled. A counter-current circulation of the liquor and the cooling water, and a constant removal of the crystallized salts are embodied in this system.

Complete data have been obtained on the crystallization of trisodium phosphate and glauber's salts and arrangements are being made for experimenting with potash salts, sodium and potassium compounds, copperas, epsom salts, phosphates and various other organic and inorganic materials.

Uniformity of the size and structure of the crystals; the production of salts free from impurities and of a high degree of fineness, the economical operation and the great labor saving; the automatic control of temperature by thermostats; the small initial investment and the little floor space required are but a few of the many claims we advance in connection with this patented apparatus



VIEW OF EXPERIMENTAL STATION AT ANN ARBOR, MICHIGAN
Showing Evaporators and Measuring Tanks

EXPERIMENTAL STATION

The Swenson Evaporator Company's evaporator experiment station at Ann Arbor, Michigan, operated in cooperation with the University of Michigan, was primarily established for theoretical investigations regarding design. However, the facilities are so unusual that we have decided to accept concrete problems on the investigation of new processes and the adaptation of evaporators to particular solutions. This evaporator experiment station is fully equipped to make comprehensive and detailed reports with all the necessary numerical data

Some of the problems already handled in this evaporator experiment station are: the manufacture of high grade table salt from very impure dilute brines; the manufacture of a high grade potash salt from complex western brines; the evaporation of a very viscous dextrin syrup of high densities; the design of a lead evaporator for the manufacture of alum, etc.

Our theoretical investigations are proceeding steadily and much valuable data has already been secured in the way of curves and constants, having to do with factors that affect evaporator design. We have prepared a program of work to be done that will probably take five years to complete, and maintain for this purpose, as well as for commercial investigation, an organization which devotes its entire time to these duties.

We have facilities for securing all data needed to properly design a commercial plant and also are preparing to handle processes involving filtration, crystallization and centrifugence in addition to the actual step of evaporation.

A reasonable charge is made for process work, also for simple experimenting, and our facilities are such as to permit us to make tests that are positively indicative of what may be expected in a large plant.

SWEET'S STEEL COMPANY

Manufacturers of Steel Rails and Rail Accessories
100 SWEET STREET, WILLIAMSPORT, PA.

BRANCHES
Philadelphia Pa Land Title Bldg Wilkes-Barre Pa Miners Bank Bldg New York, N Y, 2 Rector St
Cable Address "SWESTEELCO" Williamsport Western Union Five Letter Code

PRODUCTS

Steel Tee Rails in light and heavy A.S.C.E. standard sections, also special sections.

Fabricated Track, Straight and Curved.

Track Accessories—Steel Cross Ties (or sleepers), Splice Joints, Angle Joints with complete track fastenings, Frogs, Switchpoints, Turnouts, Crossings, Track-Climbers, Approaches, Ground-throws, Spikes, Track Bolts, etc.

We also roll Light Steel Angles, Channels, Flats and Concrete Reenforcing Bars in plain round, square, twisted square, etc.

STEEL RAILS AND FASTENINGS

We roll standard A.S.C.E. section rails, both light and heavy, from high grade new first quality stock. This stock is required to pass severe chemical and physical tests to insure a thoroughly satisfactory rail section. The care exercised in the selection of material and rolling insures a uniform rail, free from flaws and defects, and suitable for extremely hard usage.

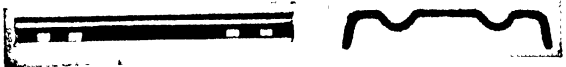
Lengths—We furnish regular standard all fifteen ft. and thirty ft lengths with 10% shorts to 22 ft, as well as mill lengths 22 to 30 ft. with splice bar punching. Other lengths supplied when desired, also bond drilling.

STEEL CROSS TIES

The designing and rolling of our Steel Cross Tie Sections for Permanent, Portable Industrial or Mine Track is an evolution, and was not decided upon until after an exhaustive study on the part of our Engineering Department had been made of the several Steel Cross Tie Sections now on the market. In the designing of our Sections, we have not only eliminated the weak points of other Sections, but have strengthened the strong points. One of the prime factors making this possible is that we roll our Steel Ties from High Carbon Steel; in other words, the Carbon content of the Steel from which we roll is two to three times higher than that used in the rolling of competitive Tie Sections. This, combined with the double corrugated feature of the Ties, affords much greater resiliency, and at the same time greater rigidity, than that of any other similar Sections on the market. One other important feature with our Tie Sections is, that the double corrugation permits of the attaching of Tee Head Bolts and Clips directly opposite each other, which is a distinct mechanical advantage.

Method of Attaching Rails to Ties—The placing of Fastenings attaching Rails to Ties directly opposite each other over the flange of the Rails, using Tee Head Bolts and Clips, represents greater engineering and mechanical efficiency than the so-called staggering of Clips, and is conceded by Engineers and users to be by far the most practical, even in view of the fact that many methods of later design are being advocated.

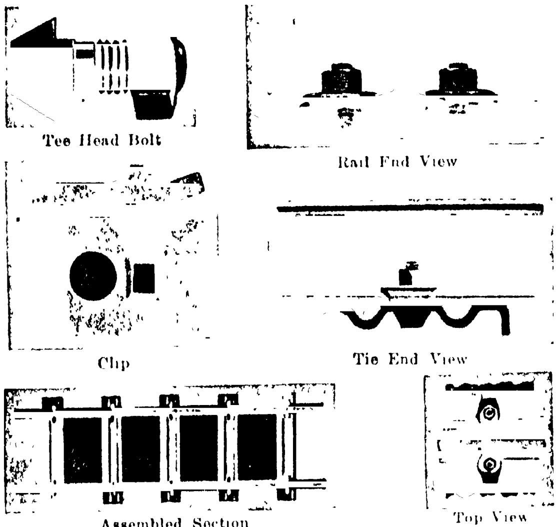
Our Portable Track Materials are all accurately rolled and punched ready for fabrication. The work of quickly and accurately laying Tracks is so simplified that even the most inexperienced laborer can perform his duties efficiently.



DOUBLE CORRUGATED STEEL CROSS TIE

No 4 Section Weight approximately 2½ lbs per ft for 8, 12, 16- and 20 lb rails

No 5 Section Weight approximately 3½ lbs per ft for 25-, 30-, 35, 40 and 45 lb rails



Tee Head Bolt

Rail End View

Clip

Tie End View

Assembled Section

Top View

DETAILS OF TIE AND RAIL ASSEMBLY WITH BOLT AND CLIP

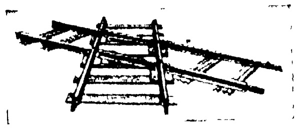
ASSEMBLED SECTIONS

We furnish switches for two or three-way switching. Our standard two-way switches are ten feet long with a radius of fifteen feet, or fifteen feet with a radius of thirty feet. The standard three-way switches are fifteen feet long with a radius of thirty feet. Fifteen-foot switches are recommended especially in connection with portable track, as a fifteen-foot track section can be substituted for the switch or vice versa within a very few moments.

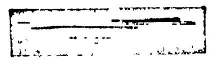
We also furnish Assembled Track Climbers, Crossings, Turnouts, Frogs and Switch-throwing devices.

TWO-WAY SWITCH

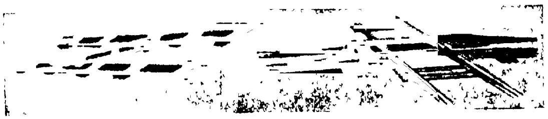
THREE-WAY SWITCH



TRACK CROSSING



FROG



TEMPORARY CROSSOVERS OR CLIMBERS

THE TERRY STEAM TURBINE COMPANY

MAIN OFFICE AND WORKS: HARTFORD, CONN.

BRANCH OFFICES AND AGENCIES IN PRINCIPAL CITIES

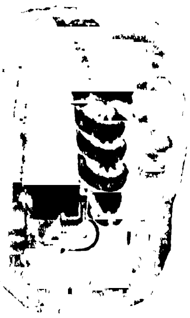
PRODUCTS

Terry Steam Turbines, condensing and non-condensing; Turbo-Generator Sets; Turbo-Pump Sets and Turbo-Blowers.

TERRY TURBINES

Terry Turbines are furnished separately or with driven apparatus in complete units with or without reduction gears. Turbine sets include all kinds of centrifugal pumps for every service, turbo-generators, alternating or direct current, for lighting or power purposes; induced draft fans, exhausters, turbo-compressors and forced draft fans. Over 7500 Terry turbines in operation.

Capacities—Horizontal Terry turbines are built in sizes from 1 to 1500 H.P., vertical types up to 600 H.P.



ACTION OF THE STEAM IN THE TERRY TURBINE

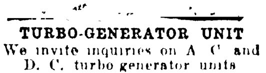
Whereby the steam is returned to the wheel again and again until all the available energy is obtained

Description—The aim in developing the Terry turbine has been toward perfection in design rather than minimum first cost. High operating efficiency, long life and low upkeep cost have been considered of more value than low price. The advisability of this policy is proved by the extensive use of Terry turbines in the exacting services of large central stations and ships of the U. S. Navy. The outstanding feature which makes the Terry so simple and reliable is its principle of operation. Steam is distributed by a steam chest or steam ring to a series of nozzles. In these nozzles the steam is expanded from approximately boiler pressure to exhaust pressure. Issuing from the nozzle at high velocity, it strikes the side of the steam bucket in which its direction is reversed 180°. As the initial impact absorbs only a part of the total energy the jet of steam passes into a reversing chamber which returns it to the wheel bucket. This action is repeated several times until all of the available energy is obtained.

"The Indestructible Terry Wheel" is made of special composition steel with semi-circular buckets or pockets milled from the solid metal. The blade-like portion between these buckets receives no power-producing action from the steam but merely serves to split the jet. The power-producing action of the steam takes place entirely on the curved surface at the back of the bucket, therefore, erosion does not alter the angle at which steam enters or leaves the bucket. This is why the Terry maintains its original efficiency after a great many years of service. The fact that steam impinges against the wheel in a direction perpendicular to the axis makes it unnecessary to provide for end thrust. There is an inch or more side clearance on the wheel, the blades of which are protected by projecting rims. These projecting rims will take care of any rubbing which might occur if the radial clearance became reduced.

The essential feature of the Terry principle is that the multiple velocity effect necessary for highest economy in a single stage, non-condensing turbine is obtained in a single row of totally enclosed radial buckets instead of a number of rows of exposed buckets having side clearances.

TURBO-GENERATOR SETS

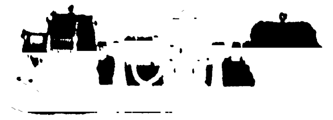


TURBO-GENERATOR UNIT

We invite inquiries on A. C. and D. C. turbo generator units up to 1,000 K.W.

Built in sizes up to approximately 1000 K.W. Used extensively as main units in small plants or auxiliary sets in large plants. They are compact, fool-proof and will operate almost indefinitely without attention. Independent nozzle control gives high efficiency over greatly varying loads.

DUPLEX EXCITERS

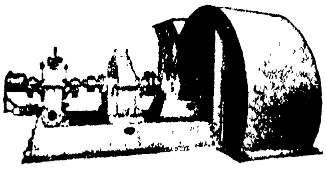


DUPLEX EXCITER UNIT

Used extensively because of reliability and adaptability to automatic heat balance

These sets consist of an exciter-generator driven from one end by a motor and from the other end by a specially governed Terry turbine. The exciter ordinarily is driven by the motor. Should the motor fail the turbine will automatically take hold without causing appreciable fluctuation in the exciter voltage.

FORCED AND INDUCED DRAFT SETS



INDUCED DRAFT FAN

Small space and light foundations make it readily adaptable to plant conditions

Fan units are usually installed in objectionable locations, often requiring very light foundations in places where they are subject to excessive heat and dirt. The Terry turbine with its freedom from vibration, its ability to operate over long periods under adverse conditions without attention, is particularly adaptable to this service.

TURBO-PUMP SETS

GEARED CONDENSER CIRCULATING PUMP

We invite inquiries on complete pumping units for all classes of service

The Terry turbine is especially adaptable to driving centrifugal pumps because of its extreme flexibility of control. For power plant work it is far superior to electric motor drive because of its increased reliability.

REDUCTION GEARS

THE TERRY GEAR

Horizontally split throughout, giving complete accessibility

The teeth are cut by the most accurate methods and the lubricating system is unusual in the ample supply of cool oil under pressure to the bearings. All Terry gears have forced feed lubrication, ring oiling not having been found satisfactory. Cooling is effected by large water chambers, cored in the walls of the gear case, doing away with risk of leakage where pipe cooling coils are used.

COMBINED TURBINE GEAR UNITS

In sizes up to 125 H.P. geared turbine units may be obtained in one common rigid frame casing. Each part of the unit possesses the same features of design contained in the separate turbine and gear. The advantages of this type of unit are: decreased cost, light weight, compactness, maintained correct alignment and no flexible coupling.

SWEET'S STEEL COMPANY

Manufacturers of Steel Rails and Rail Accessories

100 SWEET STREET, WILLIAMSPORT, PA.

BRANCHES

Philadelphia Pa Land Title Bldg Wilkes-Barre Pa Miners Bank Bldg New York, N Y, 2 Rector St
Cable Address SWESTEELCO" Williamsport Western Union Five Letter Code

PRODUCTS

Steel Tee Rails in light and heavy A.S.C.E. standard sections, also special sections.

Fabricated Track, Straight and Curved.

Track Accessories—Steel Cross Ties (or sleepers), Splice Joints, Angle Joints with complete track fastenings, Frogs, Switchpoints, Turnouts, Crossings, Track-Climbers, Approaches, Ground-throws, Spi'tes, Track Bolts, etc.

We also roll Light Steel Angles, Channels, Flats and Concrete Reenforcing Bars in plain round, square, twisted square, etc.

STEEL RAILS AND FASTENINGS

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Lengths—We furnish regular standard all fifteen ft. and thirty ft lengths with 10% shorts to 22 ft, as well as mill lengths 22 to 30 ft. with splice bar punching. Other lengths supplied when desired, also bond drilling.

STEEL CROSS TIES

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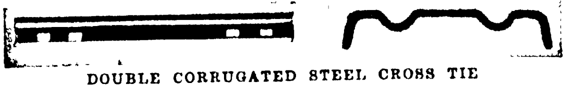
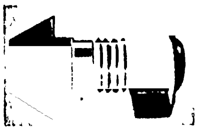


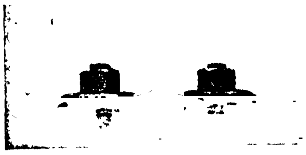
DOUBLE CORRUGATED STEEL CROSS TIE

No 4 Section Weight approximately 2½ lbs per ft for 8, 12, 16- and 20 lb rails

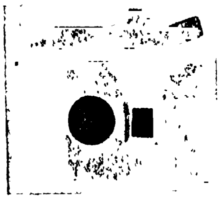
No 5 Section - Weight approximately 3½ lbs per ft for 25-, 30-, 35, 40 and 45 lb rails



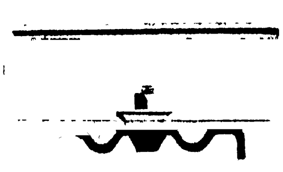
Tee Head Bolt



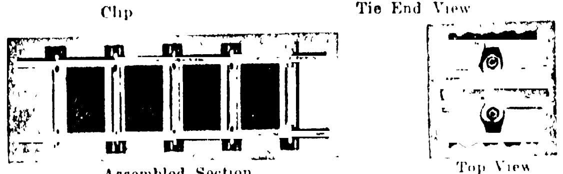
Rail End View



Clip



Tie End View



Assembled Section Top View

DETAILS OF TIE AND RAIL ASSEMBLY WITH BOLT AND CLIP

ASSEMBLED SECTIONS

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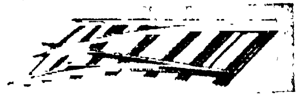
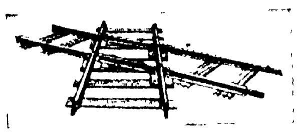
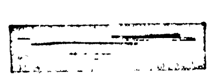


TWO-WAY SWITCH

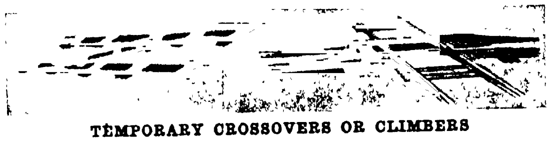
THREE-WAY SWITCH



TRACK CROSSING



FROG



TEMPORARY CROSSOVERS OR CLIMBERS

JOHN THATCHER & SON

Manufacturers of Steel Tanks

Cabinet Makers Contracting Builders

56-60 PARK AVE., BROOKLYN, N. Y.

PRODUCTS

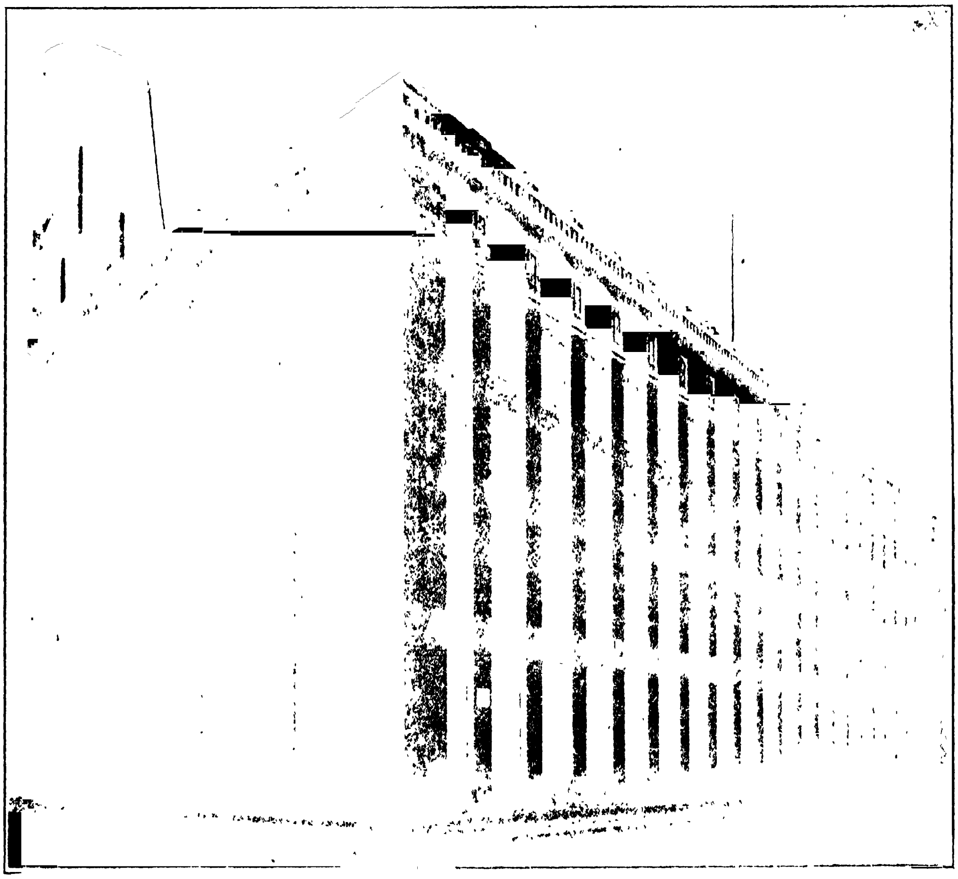
- Buildings in
  - Reenforced Concrete
  - Steel Construction
  - Brick Construction
  - Timber Construction
- Cabinet Work
- Steel Tanks
- Light Structural Steel
- Ornamental Iron Work

SERVICES

An excellent organization (organized 1873) for the correct and rapid construction of Buildings of any nature or description, large or small. One of the few of its kind conducting a general building construction business that own and operate its own steel fabricating shops and cabinet shops, as well as conducting its own field construction operations, thus making it possible to render a complete service more speedily and economically than under the sub-contract system.

A FEW OF OUR CLIENTS

- Jones Bros. Co
- National Lead Co
- Thompson & Norris Co.
- Arbuckle Bros.
- United States Electro Galvanizing Co
- Benjamin Moore & Co
- Loft, Inc.
- Frederick Loeser & Co.
- Brooklyn Warehouse & Storage Co
- Abraham & Straus.
- Richard Young Co
- Brooklyn Union Gas Co
- Brooklyn Edison Co., Inc.
- New York Telephone Co.
- Brooklyn Rapid Transit Co
- New York Central & Hudson River R R Co
- Fraser Tablet Co.
- Chelsea Fibre Mills
- Maltine Company
- E. R. Squibb & Sons



PLANT OF RICHARD YOUNG CO., NEW YORK, N. Y.

THE THERMAL SYNDICATE, LTD.

Borden Building
350 Madison Ave., at 45th Street
NEW YORK, N. Y.
MAIN OFFICE Wallsend on Tyne England

PRODUCTS

Vitreosil Concentrators; Condensing Equipment; Coolers; Crucibles; Cylindrical Retorts, Pots and Linings; Distilling Outfits; Electrically Heated Stills; Electrical Immersion Heaters; Evaporating Dishes; Fume and Outlet Pipes; Glover Tower Outlets; Hydrochloric Plant; Niter Pot Pipes; Nitric Details; Pipe, Plain or Socketed; Retorts; Retorts for Mercuric Chloride Manufacture; S-bend Sets; Steam Jets; Tanks; Towers, Reaction, Denitration or Absorption; Trays; Tubes for Reactions; Special Chemical Plant Equipment; Transparent Tubes and Utensils; Vitreosil Laboratory Apparatus (Combustion and Pyrometer Tubes, Crucibles, Evaporating Dishes, Capsules, Casseroles, Beakers, Muffles, Rods, etc.).

Vitreosil is the registered trade-mark name for the fused pure silica and quartz wares made by the patented electric furnace process of The Thermal Syndicate, Ltd.

Vitreosil is protected by the following United States patents covering both product and process:

	812,399	Feb. 13, 1906
	822,424	June 5, 1906
	836,558	Nov. 20, 1906
Reissue	13,504	Jan. 7, 1913

GENERAL

It was not until the development of the electric furnace process of The Thermal Syndicate, Ltd., that fused silica apparatus of suitable size for manufacturing processes or ware sufficiently low in price for ordinary laboratory operations could be produced. The articles produced by the fusion of rock crystal in the oxyhydrogen blowpipe prior to the successful adaptation of the electric furnace to this problem in 1904 were of very limited size and so expensive as to render their utilization commercially impossible.

The raw material used in the manufacture of vitreosil is extremely pure, the finished product containing about 99.8% SiO_2. No foreign ingredient is added to the raw material at any stage of the manufacturing process.

The ordinary quality of vitreosil, especially in the larger sizes for the chemical industries, is opaque on account of the inclusion distributed through the mass, of innumerable small air bubbles representing the interstices between the original grains of raw material when packed in the furnace. The transparent and translucent qualities of the ware are produced by special methods which permit the exclusion of the greater part of the air bubbles. Transparent vitreosil is considerably stronger than the opaque variety, and is also slightly heavier.

PHYSICAL PROPERTIES

Critical Temperatures—The melting point of vitreosil is 1750°C., its softening point 1400°C. and the devitrification point about 1100°C., the latter depending somewhat on the surrounding atmosphere. It is therefore practicable to employ suitable vitreosil equipment for continuous use up to 1100°C. and for intermittent use at much higher temperatures.

Thermal Expansion—One of the most valuable of the many unusual characteristics of vitreosil is its extremely small expansion and contraction with variations of temperature, its linear expansion of .0000054 per degree Centigrade being the smallest of any known material. The following table shows a comparison with other well known substances:

Material	Linear expansion per degree Centrigrade
Fused silica	0000054
Nickel Steel (36% Ni)	0000009
Glass Jena 59	0000057
Glass Pyrex 702 EJ	0000035
Berlin Porcelain	0000028

This small expansion coefficient results in the remarkable resistance to sudden temperature changes which is often demonstrated in the case of small vitreosil articles by heating the utensil to redness and immersing it in cold water, repeated treatments not weakening the ware in any way.

Hardness—Vitreosil is extremely hard as is shown by the fact that it will scratch glass readily, its degree of hardness being number seven on Moh's scale where the diamond ranks as ten. This property is of importance where attrition is likely to result in depreciation of softer materials as in Glover Tower exit pipes.

Weight—The specific gravity of transparent vitreosil is approximately 2.22 and of the non-transparent material about 2.07. In many parts of a chemical plant, this light weight as compared with metals is a decided advantage in arranging supports and accessories for cooling and condensing details.

Electrical Characteristics—Investigations by the Bureau of Standards and the National Physical Laboratory show the superiority of fused silica as an electrical insulator compared with glass, porcelain and similar materials, the resistance decreasing much more slowly with rise of temperature, while the higher melting point of fused silica permits its employment at temperatures where the use of glass and porcelain is out of the question. According to Bureau of Standards Scientific Paper No. 234, hard rubber, mica, porcelain and glass have much smaller volume resistivities than fused quartz, even at room temperature. The dielectric strength of vitreosil is also very high.

Vitreosil is Non-Hygroscopic—As moisture does not readily condense on its surface, leakage with vitreosil insulators is likely to be much less than with glass and ceramic materials. It has been found that fused silica is an excellent insulator even in an atmosphere saturated with moisture.

Constancy of Weight and Volume—Experiments have shown that vitreosil is superior to platinum in constancy of weight and on account of its negligible coefficient of expansion it does not alter in volume at the temperatures attained in work with hydrometers, pycnometers, manometers, etc. When used for higher temperatures as in the construction of mercury or gas thermometers or thermostats the small change in volume which occurs is constant for the rise in temperature and the apparatus returns to its original volume without appreciable lag upon cooling.

Optical Properties—Fused quartz or silica is the only material available in the various forms required

Continued on Next Page

for work with ultraviolet light which possesses sufficient transparency to the short wave lengths whose activity is utilized in industrial illumination, for sterilizing liquids, and for accelerating chemical reactions. The optical properties of transparent vitrified quartz have not been fully studied, but its approximate index of refraction is apparently decidedly less than that of unfused quartz.

Permeability—Vitreosil becomes slightly permeable to hydrogen, though to a less extent than platinum, at about 1000 C. It is, however, gas tight under ordinary conditions and is extensively employed in the form of vacuum tubes for high temperature work.

Vitreosil tubes may be readily evacuated and can of course be employed at much higher temperatures than glass tubes without danger of collapsing.

Solubility—The most delicate electrical and chemical tests point to the complete insolubility of vitreosil in distilled water, no other material known being its equal in resistance to the solvent action of pure water.

CHEMICAL PROPERTIES

Resistance to Acids Sulphuric, nitric, hydrochloric, hydriodic, hydrobromic, arsenic and chromic acids as well as the halogens are without action on vitreosil regardless of concentration or temperature Phosphoric acid has a slight but appreciable action, while hydrofluoric acid attacks fused silica to about one-sixth the extent of its action on glass.

Resistance to Metals and Elemental Substances—Molten zinc, cadmium and tin and the noble metals do not attack vitreosil appreciably, and there is no noticeable chemical action with molten sulphur.

Resistance to Alkalies and Basic Substances—At normal temperatures vitreosil is attacked in a smaller degree by alkaline solutions than the best grades of glass, but at higher temperatures it is strongly attacked by alkalies. Ammonia is, however, an exception and may be purified by distillation in vitreosil apparatus. Metals which form basic oxides should not be heated in vitreosil under oxidizing conditions, and the ware will not stand direct contact with caustic alkalies at high temperatures.

APPLICATIONS

Vitreosil will be found of particular value to technologists and manufacturers in the following fields:

Actinochemistry
Analytical Laboratories
Chlorinations
Chlorosulphonic Acid
Electrical Insulators
Ferric Chloride
Heaters, Electrical
Heaters, Gas
Hydriodic Acid
Hydrobromic Acid
Hydrochloric Acid
Lamps, Gas
Lamps, Mercury Vapor, etc
Mercury Compounds
Metallurgical Investigations
Molybdenum Manufacture
Nitric Acid
Ozonizer Construction
Pharmaceutical and Medicinal Chemicals
Phosphoric Acid
Physical Laboratories
Precious Metal Refining
Pyrometry
Radium Compounds
Reagents
Research Laboratories
Sulphuric Acid
Thermometry
Thermostatic Control
Thorium Nitrate
Tungsten Manufacture
Waste Acid Recovery
Water Distillation Outfits
Zinc Chloride

More detailed information regarding the application of vitreosil to the above problems will be gladly furnished on request.

STANDARD EQUIPMENT

Standard forms of vitreosil equipment include the following:

Concentrators—Vitreosil cascade units were originally designed for the concentration of sulphuric acid as their complete insolubility and indifference to temperature changes rendered vitreosil dishes especially adaptable to the work. The uses of cascade concentrators are, however, no longer confined to sulphuric acid, but include such materials as zinc chloride, ferric chloride and phosphoric acid They are suitable in general for the concentration of non volatile solutions which are corrosive due to acid content or reaction.

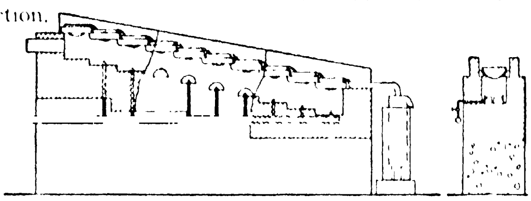


FIG. 1A CONCENTRATOR CASCADE UNIT

The above illustration shows a small unit, gas-fired to permit accurate temperature control, and especially adapted to handling moderate quantities of material of high purity. This type of apparatus is valuable for the concentration of solutions having relatively uniform boiling points throughout the range of concentration which would not permit of heating from a single source.

Vitreosil cascade concentrators can be supplied in a considerable range of capacities in single units or may be installed in a battery of units of any given capacity. This latter arrangement allows of greater flexibility of installation to meet fluctuating market conditions than if a single unit of large capacity were installed.

The vitreosil dishes are directly exposed to the fire gases so maximum efficiency is obtained with low fuel consumption. They are indifferent to temperature changes, ensuring low replacement and maintenance costs. Being entirely unaffected by the usual mineral acids, purity of product is promoted and the cost of operation is kept down. The cascade unit is very simple to operate, there being but two variables, fire and feed.

In cases where the vapors from the concentrator are not objectionable, concentration may be carried on in uncovered vitreosil cascades. Where objectionable vapors are given off, the cascade may be covered with acid proof refractories of the same material as the refractory seatings used to support the dishes over the firing flue. The fume chamber thus formed is connected by vitreosil outlet pipes to a scrubbing tower.

Coolers—S-bend or pot type coolers of vitreosil will withstand severer conditions of temperature change and corrosion than cooling equipment of any other material

Crucibles, Unglazed -In capacities from 350 cc to 22½ liters Can be furnished with vitreosil cover plates ground to fit

Cylindrical Retorts, Pots and Linings In sizes up to 18" internal diameter, 30" long with one end closed and the open end either plain or socketed

Distilling Outfits—Standard sets comprise retort, cover, trapped inlet tube, vapor outlet connecting tube and condensing battery of three drawn tube S-bends As all parts are of vitreosil, the product cannot become contaminated from the equipment

Electrically Heated Stills—In various capacities to order. For fine chemical manufacture.

Electrical Immersion Heaters For direct heating of corrosive liquids All parts exposed to the electric current, to high temperatures, or to corrosion, are made of vitreosil.

Evaporating Dishes—These are now obtainable from stock in eighteen sizes of unglazed vitreosil in capacities of 400 cc. to 22,500 cc, eight sizes of glazed non-transparent dishes in capacities of 25 cc. to 500 cc, and six sizes in the clear,

Continued on Next Page

transparent quality of vitreosil ranging from 25 cc to 200 cc in capacity

Fume and Outlet Pipes—For general use in handling acids in either the gaseous or liquid state Vitreosil pipe and connections are not attacked by condensed acid and will withstand wide temperature changes without injury Their very light weight is an additional advantage in providing necessary supports

Vitreosil fume and outlet pipes are especially useful in oil of vitriol plants using iron pan sets for concentration

Condensing Equipment—Usually constructed on the reflux system for nitric acid and similar materials Vitreosil condensing units consist essentially of S-bends, occupy little space for their capacity and permit of easy rearrangement when required. Other materials than vitreosil will resist chemical action successfully or will withstand direct water-cooling without injury, but vitreosil is the only condensing equipment which is entirely indifferent to both chemical and thermal conditions.

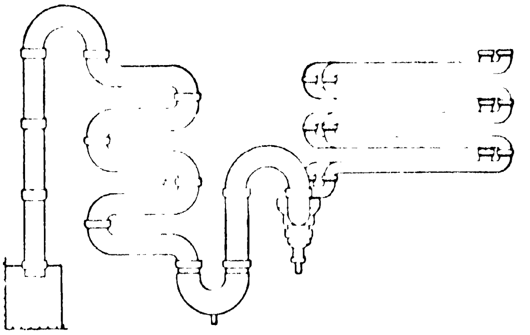


FIG. 2A REFLUX CONDENSER

Glover Tower Outlets—The three properties of resistance to corrosion, indifference to temperature changes and hardness combine to render vitreosil outlets for Glover towers a decided improvement over metal or earthenware

Hydrochloric Plant (Synthetic) Vitreosil tube burners for the combustion of hydrogen in chlorine and S-bend cooling sets are indispensable in the manufacture of hydrochloric acid by direct combination of the two elements The temperatures reached in this process are of course much higher than those involved in making hydrochloric acid by the older methods, the S bends connecting with the combustion furnace frequently operating at a visible red heat

Vitreosil also constitutes the most satisfactory and economical form of cooling equipment for acid made by decomposing salt with sulphuric acid as water-cooled vitreosil S-bends are compact, non-porous, and unaffected by thermal or chemical conditions We are now able to supply vitreosil absorption vessels so designed as to permit complete immersion for water-cooling

Niter Pot Pipes Vitreosil acid inlet pipes for niter pots soon pay for themselves as they eliminate the frequent renewals made necessary in the case of iron or earthenware pipes by the high temperature and the corrosive action of the acid

Nitric Details—In addition to our standard S-bend sets for nitric condensation, we can supply vitreosil Guttmann condenser pipes, tubes and manifolds for Hart condensers, and various fittings in vitreosil for Uebel and Valentiner plants Cooler pipes and other vitreosil details for works producing nitric acid by oxidation processes provide a form of equipment free from deterioration due to high temperatures or corrosion

Pipe—Plain or with one end Socketed—Carried in stock in sizes from 2″ to 18″ internal diameter. For conveying and cooling acid gases, manufacturing pure acids and for various special applications in the chemical and electrical industries where material is required having unusual resistance to extreme chemical, thermal and electrical conditions

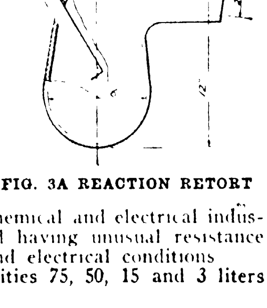


FIG. 3A REACTION RETORT

Retorts—In four sizes (capacities 75, 50, 15 and 3 liters when full) For use with corrosive chemicals at high temperatures as reaction vessels, receivers, etc

Reaction Retorts—The small retort shown in figure 3a is especially intended for the production of mercuric chloride by direct reaction between chlorine and mercury This method of making corrosive sublimate has the advantages that it employs a direct synthesis from the elements, is continuous, and assures a product of great purity These retorts furnish a convenient means for performing high temperature reactions between corrosive gases or liquids in general where the resultant product comes off as a vapor Retort only, as shown, $16.75 each Tubes extra, depending on size

S-bend Sets—Are especially suitable for cooling, condensation and concentration. S-bend units occupy less space than horizontal or vertical lines of straight pipes, are easily arranged for water cooling, and permit the ready removal of individual pipes without disturbing adjacent pieces All joints are horizontal so packing is facilitated and thorough luting of the joint is certain

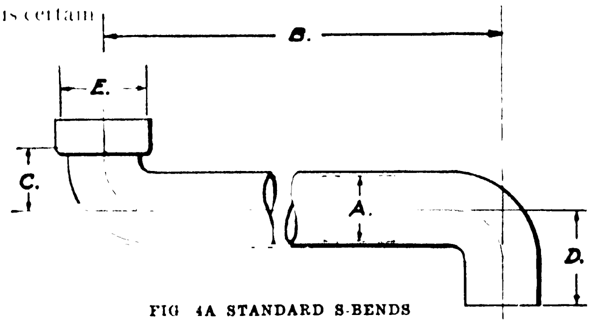


FIG 4A STANDARD S-BENDS

No	Dimensions—Inches					Price—Each
	A	B	C	D	E	
No 1	4	10	4½	5¼	5¼	$23 25
No 2	5	10	5	8	7	24 00
No 3	6	10	6	9	8	33 25
No 4	8	10	7	10	10⅛	43 25
No 5	9	12	7¼	9½	11	50 00
No 6	2	78	3¼	4½	3½	33 25
No 7	4	78	4¼	5¼	5¾	36 75
No 9	6	78	5¾	9	8¼	53 25

In figuring the over all height of a series of vitreosil S-bends it is necessary to allow a plus or minus variation of ¼″ from dimensions C and D given in above table.

We carry in stock a good supply of standard vitreosil S-bends with necessary vitreosil fittings.

Steam Jets—Vitreosil steam jets are not only non-corrodible and unbreakable with sudden changes of temperature, but owing to the hardness of fused silica, the orifice is not readily enlarged by friction.

Tanks Rectangular vitreosil tanks are useful for operations involving the hot electrolysis of solutions or similar processes where the high temperatures or sudden temperature changes involved would prevent the successful use of earthenware

Towers—Reaction, Denitration or Absorption—Vitreosil towers are usually supplied in sections either 12″ or 15″ internal diameter They are light in weight, do not crack under temperature changes occurring in operation and are not affected in any way by contact with the usual mineral acids.

Trays—For drying, roasting and sintering Vitreosil trays are especially suitable for the convenient handling of material in muffles or on hot plates. Stocked in fourteen sizes

Tubes for Reactions—In either straight or S-bend form can be supplied in practically any length and in diameters up to 4½ inches internal Drawn vitreosil tubing is light in weight, possesses great regularity of wall thickness and resists perfectly either external or internal heating. These tubes can also be supplied with inset sections of the transparent tubing where visibility is desired

Special Equipment—Special vitreosil apparatus is not necessarily expensive and can be supplied promptly. We shall be glad to cooperate in the design of equipment which you may need to meet unusual requirements.

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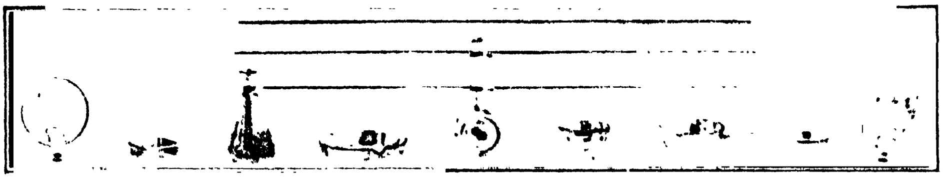


FIG. 5A TRANSPARENT VITREOSIL TUBING AND LABORATORY APPARATUS

Catalogs—Catalogs, price lists and blue prints covering our industrial equipment in vitreosil, glazed vitreosil laboratory ware, and transparent vitreosil tubing and utensils will be sent upon request.

TRANSPARENT VITREOSIL

The Thermal Syndicate, Ltd., manufactures by new processes a complete line of transparent vitreosil tubes, laboratory utensils, etc. Improved methods of production enable the ware to be offered in larger sizes than formerly, and at prices very much lower than those formerly charged for transparent silica ware. At present prices it is possible to employ transparent vitreosil for practically any operation where its valuable properties would render its use advantageous.

While the prices for transparent vitreosil given on this page refer in many instances to small articles especially designed for laboratory use, they cover a variety of shapes and sizes which are applicable to industrial operations, and will afford those who are interested in the industrial application of transparent vitreosil, an indication as to approximate costs on commercial propositions.

We give below a table showing diameter, wall thickness and length of standard transparent vitreosil tubes, together with price per foot

TUBES (Transparent)

Bore In	Bore mm	Max Std Wall thickness mm	Max Std Length	Price per Ft. (30 cm.)
1/32–1/16	1–1½	1–2	5'	$1 00
1/16	1½–2	1–2	5'	1 25
1/8	3	2	5'	1 90
3/16	4	2	5'	2 15
3/16	5	2	5'	2 40
1/4	6	2	5'	2 90
1/4	7	2	5'	3 15
5/16	8	2	5'	3 40
3/8	9	2	5'	3 65
3/8	10	2	5'	4 00
7/16	11	2	3'6"	5 00
1/2	12	2	3'6"	6 00
1/2	13	2	3'6"	7 00
9/16	14	2	3'6"	8 00
5/8	15	2	3'6"	9 00
5/8	16	2	3'6"	9 50
11/16	17	2	3'6"	10 00
11/16	18	2	3'6"	10 50
3/4	19	2	3'6"	11 00
13/16	20	2	3'6"	12 00
7/8	22	1½	2'0"	13 00
1	25	1½	2'0"	14 00
1 3/16	30	1½	1'6"	17 00

Flasks are supplied either transparent throughout or with opaque vitreosil neck and side tube and transparent vitreosil bulb. Price list of standard sizes is given below:

FLASKS (Round or Flat Bottom)

	All Transparent		Bulb only Transparent	
Capacity cc.	Plain Flask Price Each	Distilling Flask Price Each	Plain Flask Price Each	Distilling Flask Price Each
25	$1 25	$6 75	$3 20	$5 05
50	5 75	8 25	4 30	6 20
100	7 50	10 00	5 65	7 50
150	8 75	11 25	6 55	8 45
200	10 00	12 50	7 50	9 40
250	11 25	13 75	8 15	10 30
300	12 50	15 00	9 40	11 25
400	15 00	17 50	11 25	13 15
500	17 50	20 00	13 15	15 00
1000	30 00	35 00	22 50	26 25

Transparent vitreosil plates, on account of their translucency to ultraviolet light, are especially suitable for use as covers of vessels used as containers for chemicals reacting under the influence of the ultraviolet rays

They are extremely useful as sight glasses for high temperature stills, retorts, etc., for which purpose they are supplied with both sides ground and polished, at a slight increase over list prices

PLATES (Transparent)

Thickness Inches	Thickness mm	Maximum Area Inches	Price per Square Inch
1/16	1 5	[illegible]	$ 65
1/8	3	5 x [illegible]	95
3/16	4 5	4 x 4	1 25

Large transparent vitreosil tubes now available should find extensive use in operations carried on at high temperatures under conditions where a clear view of the progress of the reaction is desired Transparent sections may be inserted into tubes of the regular opaque quality of vitreosil, thus using the relatively expensive transparent material only where transparency is essential, but obtaining the same resistance to heat and corrosion throughout the tube

TUBES, LARGE SIZES
(Transparent)
Usual wall thickness 2½ to 3 mm

Bore Inches	Bore mm	Maximum Length	Price per INCH
2	51	16"	$4 20
2¼	57	16"	5 00
2½	63	16"	6 00
2¾	70	16"	7 50
3	76	16"	8 20
3¼	82	12"	8 65
3½	89	12"	9 05
3¾	95	12"	9 45
4	102	12"	9 85

A complete line of transparent vitreosil laboratory apparatus duplicating standard vitreosil shapes is carried in stock. Complete price list will be furnished on request.

Composite Apparatus of Transparent and Non-Transparent Vitreosil—Can be supplied not only in tube form, but in modifications of the flask and similar types of equipment at prices considerably lower than those applying to all-transparent pieces of similar size

Special Apparatus—Transparent vitreosil may be worked into most of the forms in which glass is obtainable and we shall be glad to quote prices for special transparent vitreosil apparatus on receipt of sketches or specifications.

Electrode Seals—The insertion of electrodes into fused silica apparatus in such a way as to form a vacuum-tight connection has long been a problem of extreme difficulty confronting physical and electrical investigators. We control a patented process, available to our customers, by means of which such seals may be provided.

Duty-Free Importations—Our customary discount of 33⅓% to scientific institutions, universities, etc., applies to the transparent ware also, when specially imported free of duty.

THWING INSTRUMENT COMPANY

3318 LANCASTER AVENUE, PHILADELPHIA, PA.

New York, N. Y., Grand Central Palace
Cleveland, O., 10312 Olivet Street
Pittsburgh, Pa., 816 Ivy Street
Detroit, Mich., 417 Lightner Building
Boston, Mass., 141 Milk Street

Chicago, Ill., 342 Monadnock Block
San Francisco, Cal., 155 Second Street
Los Angeles, Cal., 716 South Hill Street
Seattle, Wash., 635 Burke Building
Toronto, Ont., 227 Davenport Road

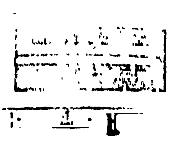
PRODUCTS

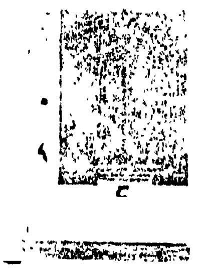
Thwing Electrical Pyrometers, Indicating and Single and Multiple Recording Systems, for measuring all temperatures from −250° C. to +3000° C. (−420° F. to +5500° F.)

THWING PYROMETERS

A Thwing Multiple-Record Indicating and Recording Pyrometer System is a real necessity wherever heat conditions are to be measured or controlled.

The recorder in the office keeps the conditions at every heat source constantly under the manager's observation, warns of irregularities, checks inexperienced men, detects the shirkers, and gives **permanent** records. These records afford the best possible means of determining and duplicating the ideal time and heat relation for perfect product, minimum fuel consumption, and maximum plant capacity, through completion of the process in the shortest possible time. The Thwing Multiple System of Recording produces one to twelve records on a single chart and thereby avoids the extra expense of additional instruments, charts, etc.


WALL PATTERN INDICATOR


6-RECORD RECORDER

The indicators at the heat sources enable attendants to keep their fires right at all times to avoid losses from over- or under-heating.

Thwing Pyrometers are made in the following types:

Type A, Thermo-Electric—For temperatures from 100° to 1600° C. (200° to 2900° F.).

Operation is based upon measurement of the electric current generated by insertion of the "hot point" of a thermocouple into the temperature to be measured.

The thermocouple is made of base metal or platinum with outer protection of fused quartz, porcelain, clay iron, etc., as conditions require and when installed as directed will give continuously accurate results with very low expense for renewals.

Type B, Radiation—For temperatures from 500° to 3000° C. (925° to 5500° F.)

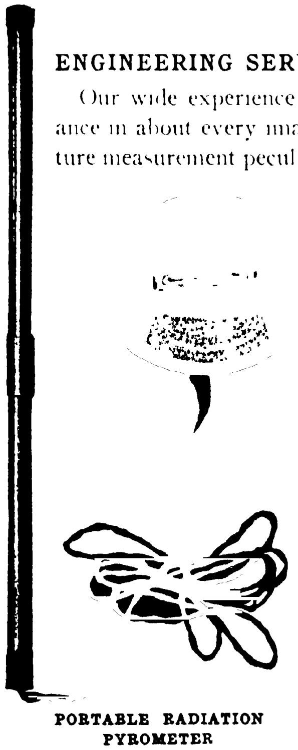
This is the quickest acting pyrometer made and is accurate to the highest temperatures. No part enters the fire nor does the operator have to get uncomfortably close to the heat. The construction is simple, practical, and very durable, and, as no focusing, leveling or reference to tables are required, readings can be taken in rapid succession.

GOLD MEDAL AWARD PANAMA-PACIFIC EXPOSITION, 1915

Made for both portable and stationary use and particularly desirable for reading temperatures in furnaces, ovens, kilns, fire pits, and within moving molten metal or other material.

Type C, Resistance—For temperatures from −250° to 200° C. (−420° to 400° F.) and in special cases up to 425° C. (800° F.).

This instrument is based upon measurement of the resistance to an electric current passing through a bulb of fine wire located at the point of temperature measurement. The resistance type is most used for measuring low temperatures where the cold ends of a thermocouple cannot easily be kept at constant temperature.


PORTABLE RADIATION PYROMETER

ENGINEERING SERVICE

Our wide experience and records of performance in about every imaginable kind of temperature measurement peculiarly fit us to offer correct advice. **We gladly and without charge render special reports and suggest desirable arrangements for difficult conditions.**

LITERATURE

Literature with detailed description of any type of Thwing Instrument and giving valuable hints on pyrometer selection and use will be sent free on request.

TIPPETT & WOOD

Designers, Manufacturers and Erectors of Steel Plate Constructions

MAIN OFFICE AND WORKS: PHILLIPSBURG, N. J.

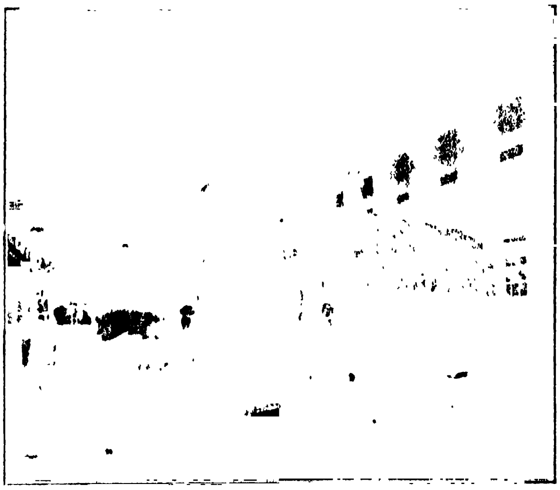
New York Office, 135 William St., New York, N. Y.

PRODUCTS

Steel tanks of every description and for all purposes. Special attention given to tanks for acids, brine, coal tar, fuel oil, gasolene, molasses, soap, etc. Standpipes, water towers, smoke stacks, breechings, flues, penstocks, riveted pipe, cylinders, boilers, condensers, ladles, hoppers, troughs, pans, dryers, receivers, bins, supports, trestles, all kinds of plate steel work and structural steel construction requiring unusual fabrication.

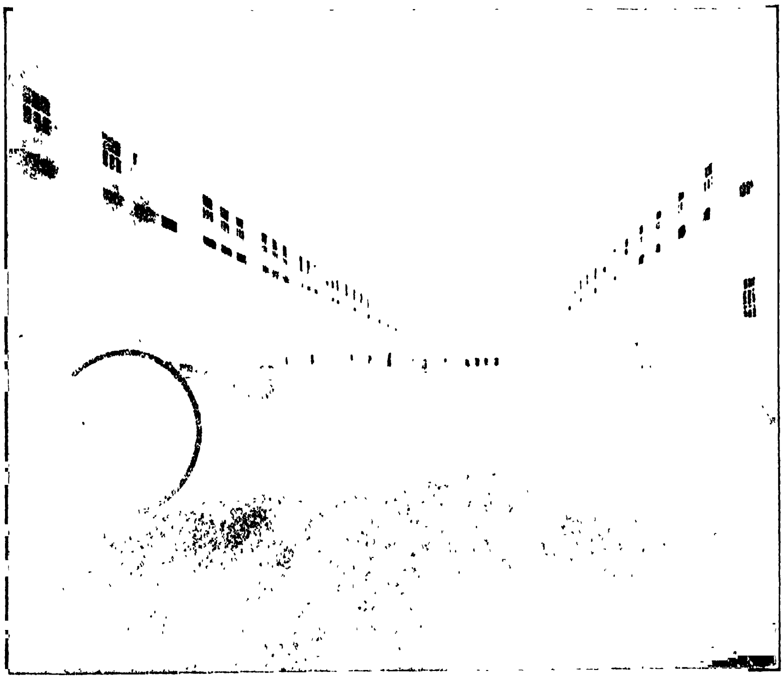
QUICK SHIPMENTS

We carry a large stock of steel plates of several thicknesses from which we make tanks of a large range of diameters. For special requirements, permit us to make slight substitutions from our stock and fabrication will proceed immediately. We are equipped and prepared for orders requiring concentration of effort resulting in unusually prompt completion of the work.



PATENTED SPRINKLER SERVICE TANK

Weight 9 tons



VIEW OF ASSEMBLY SHOP

FACILITIES

Our fifty years of experience are your benefit and assurance of proper attention and construction. Our shops, which are large and equipped with the most modern machinery, have expanded steadily during this time. We are constantly extending and installing new machinery and new methods. No work is too large for us. Send us your inquiries stating when material is required. Our engineers are at all times at your service. A catalog giving information on standpipes and water towers will be mailed upon request.

THE TIRRILL GAS MACHINE LIGHTING COMPANY

Established 1861

Manufacturers of Gas Machines and Gas Specialties

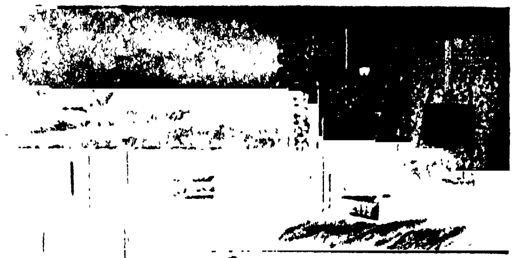
HUDSON TERMINAL BUILDING, 50 CHURCH ST., NEW YORK, N. Y.

PRODUCTS

Tirrill Gas Machines, Testing Stoves, Bunsen Burners, Laboratory Burners, Mixing Valves, Gas Stoves, Hot Water Heaters, Tirrill Underground Gasoline Storage Tanks, etc.

THE TIRRILL EQUALIZING GAS MACHINE

For Laboratory, Industrial Chemical, Cooking and Heating Purposes.



The Tirrill Installation has the approval of Underwriters—does not affect insurance rates. The **only** machine made which mixes the gas **outside** of the building

DESCRIPTION

The **Tirrill** "Equalizing" Gas Machine consists of three principal parts:

(a) The **Air Pump** or **Meter,** which is usually placed in the cellar of the building and operated by a suspended weight, or water wheel, if preferred. It is partly filled with water, the balance of its contents being air. It can be placed next to a furnace. No gas even enters this part of the machine. It produces the pressure to generate the gas and send it back to the pipes, ready for instant use. A constant and perfect pressure is assured. The machine operated by a suspended weight requires no more bother or effort than is necessary to wind an ordinary clock. Requires no running water. The water wheel operates automatically by water, using water only in exact proportion to the quantity of gas consumed.

(b) The **Gas Generator,** buried in the ground, 30 ft. from the building, contains all the gasoline. Requires filling but once or twice a year. Requires no vault of any kind. Inside the Generator is the Carburetor which floats on the top of the gasoline. The Carburetor mixes the air with the gasoline vapor and thus makes the gas. It is so constructed that it presents the largest possible evaporating surface of proved efficiency.

(c) The **Mixer** is buried in the ground near the generator. Its function is to take the gasoline vapor from the generator and thoroughly mix or "equalize" it with a given quantity of air, thus insuring that all gas drawn from it for consumption at the burners will be smokeless, uniform and of a standard quality. It is the only process which insures perfect combustion. Requires no attention.

The Air Pump or Meter, the Gas Generator and the Mixer are all constructed of the best quality cold rolled, Galvanized Bessemer Steel material. All seams and joints are thoroughly and carefully tested throughout by skilled experts. Furnished with two coats of the best, non-corrosive, asphaltum paint.

TIRRILL "EQUALIZING" GAS MACHINES ARE MADE IN THE FOLLOWING STANDARD SIZES

Size of Machine	Number of Burners or Lights	Capacity of Gas Generator	Size of Machine	Number of Burners or Lights	Capacity of Gas Generator
No 1	15 to 25	3 bbls	No 5	200	10 bbls
No 2	50	4 bbls	No 6	300	14 bbls
No 3	75	5 bbls	No 7	500	25 bbls
No 4	100	6 bbls	No. 8	1,000	50 bbls

Prices upon application.

If you want Perfect Gas Service at Minimum Cost, send for our specification

To determine proper capacity machine required state

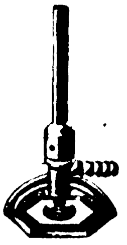
Maximum gas requirement per hour when known

Number of lights or burners or both, specifying type

Other appliances to be used, industrial, heating or domestic.

TIRRILL BURNERS

Tirrill burners have been recognized for fifty years as the standard burners for chemical and industrial plant laboratories. No other burner on the market will give the service and the economical high heat that this Tirrill burner will. Many "Tirrill type" burners are sold; but no burner is a **genuine Tirrill** unless guaranteed made by us and having the name "Tirrill" on it. Look out for imitations



NO. 2600
Price $1 25

Tirrill Laboratory Bunsen Burner No. 2600

This type of burner finds universal application in the Chemical Laboratory. It is easy to adjust to any desired intensity of heat. It is made with separate air and gas adjustment, thus yielding wide range of temperatures. They work successfully with city, natural or gasoline gas.

Another type of the Improved Laboratory Bunsen Burner is made to regulate the supply of air and gas at the same time. When ordered without the stand, the burner is made with a standard ¼" pipe thread

Price, No 2500 . . . . . . 85 each

Tirrill Blast Flame Heating Burner—This burner will deliver a heat of 2000°F. It is regulated with one movement and without burning the operator's fingers

NO. 2000
Price $1 00

Tirrill Rose Heating Burner—Made in two sizes. The 2" size is good where a moderate heat is required in laboratory work.

2" Size, Price $2 50

The 5" size is made for industrial work such as heating autoclaves, etc. It can also be used under air and gas pressure.

5" Size, Price $7 50

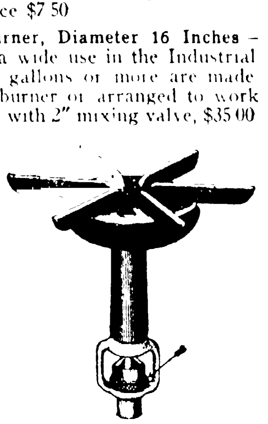
Tirrill Industrial Heating Burner, Diameter 16 Inches—This burner has lately attained a wide use in the Industrial laboratories, where batches of 5 gallons or more are made. Can be used as an atmospheric burner or arranged to work under air and gas pressure. Price with 2" mixing valve, $35 00

Furnished with air and gas adjusting cock without mixing valve, prices according to size.

Tirrill Adjustable Laboratory Heating Burner—Designed with flat circular plate having exit ports for the gas in the rim of the plate. This allows for a large heated area, and delivers more heat with less gas than any other burner made.

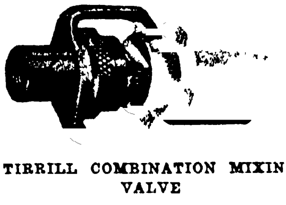
Used for cooking and Domestic Science work.

Price No 2800 with stand	$3 00 each
Price No 2700 without stand	2 50 each



NO. 2700

TIRRILL COMBINATION MIXING VALVES



TIRRILL COMBINATION MIXING VALVE

½"	valve without lever cock,	$1 25
½"	" with " "	1 50
1"	"	3 00
2"	"	15 00

These valves regulate the air and the gas at the same time, for hot plates, stills, sterilizers, autoclaves, warming closets, blast furnaces, gas fuel heating appliances, ovens, water heaters, hot plates and gas ranges.

Prices subject to change.

THE TOWNSEND FURNACE AND MACHINE SHOP CO.

ALBANY N. Y.

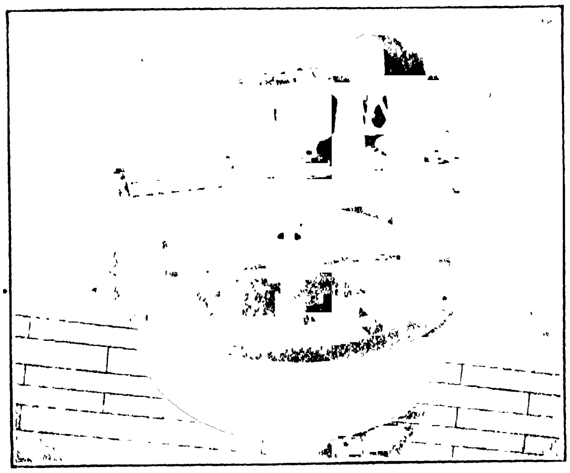
Established 1807

PRODUCTS

Evaporating Pans; Indigo Grinders; Spheroidal Grinding Mills; Sulphonating Kettles; Nitrating Kettles; Cast Iron Acid Eggs; Filter Presses; Acetone Kettles; Potash Kettles.

MIXING PANS

This worm driven pan is 78″ inside diameter by 20″ deep. The bottom and sides are machine finished. The mixer blades are arranged so as to give the best results, it being impossible for the material to get by without being thoroughly mixed.



MIXING PAN

EVAPORATING PANS

Several different forms and designs of these pans have been experimented on and it has been found expedient to use this particular type to obtain the required results. Inside dimensions are 6′ 6″ long by 41″ wide.

KETTLES

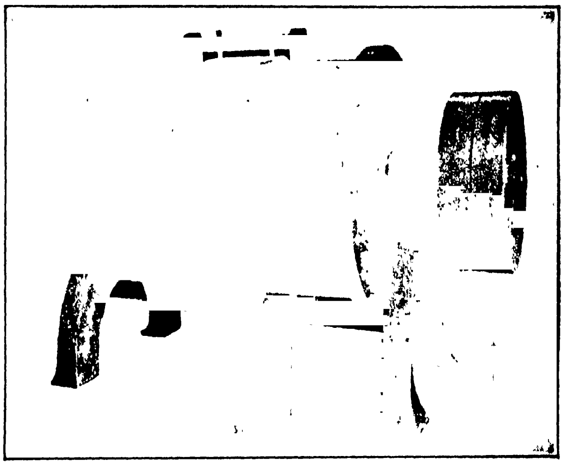
We use a mixture of cast iron in all of our Chemical Castings which was obtained after careful experiments in practical use. The result is a greatly extended life and, therefore, greater efficiency of our kettles which are used for Nitrating, Sulphonating, Acetone and Shells for acid eggs. The combined quality of our castings and this special mixture of cast iron shows itself by the satisfaction it is giving to our ever increasing list of customers.

PRESSES

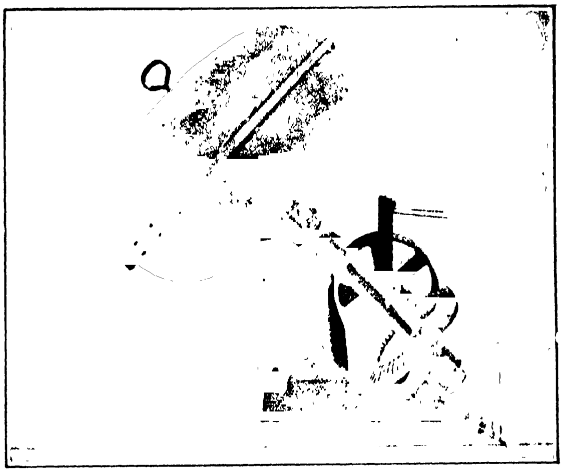
We are now manufacturing two different size presses 24″ x 24″ and 32″ x 32″, being 12 ft. between the heads. We have already sold a quantity of these which are doing efficient work. They are so well known to the trade as to need no further description.

MILLS

Our standard line of Indigo or Grinding Mills are made in three sizes: 26″ diameter by 36″ long, 32″ diameter by 42″ long, and 38″ diameter by 45″ long. Each size is fitted with two hand holes, one being on the end and the other in the center of the barrel, the cover of which is easily removed. These mills are mounted on good substantial frames which make them rigid. Sufficient cast iron balls are furnished with each outfit.



CYLINDRICAL MIXING AND GRINDING MILL



SPHEROIDAL MIXING AND GRINDING MILL

Our Spheroidal Mills are very popular with Dye Manufacturers judging by the quantity we are selling. They are very efficient and compact machines, the results obtained being highly satisfactory. Made in two sizes: 30″ diameter by 15″ and 42″ diameter by 22″.

TOLEDO SCALE COMPANY

Largest Automatic Scale Manufacturers in the World

TOLEDO, OHIO

CANADIAN TOLEDO SCALE CO., LIMITED, WINDSOR, ONTARIO

106 Sales Rooms and Service Stations in cities in the United States and Canada. Others in thirty four foreign countries

PRODUCTS

Automatic Dial Scales of the following types for weighing, computing, counting, testing and checking purposes, and other special operations; Counter, bench, portable, dormant, built-in, monorail, tank and truck scales.

TOLEDO SPRINGLESS INDUSTRIAL SCALES, AUTOMATIC AND INSTANTANEOUS

Tons may now be weighed with the same speed as pounds. Instantly indicating correct weight on their easily-read, clock-faced dials, Toledo Scales make accuracy of heavy weighing automatic and uniform, instead of its being dependent upon the patience and skill of the individual operator.

In fact, wherever you find progress and leadership in any line of industrial endeavor, there you find Toledos have replaced the old beam types and weighing is now an automatic operation. With Toledos all you do is roll the load on the platform, glance at the big figures on the dial, the job is done.

Toledo Scales safeguard profits, speed up production, simplify factory problems, prevent waste and facilitate shipping. They are rugged, simple in operation and always reliable.

SPECIAL OPERATIONS

The Toledo Industrial Scale is more than merely a fast automatic weighing machine—its uses for special operations in factories are numerous and important.

Besides Toledo Automatic Scales for general weighing purposes there are Toledos for compounding mixtures, for measuring liquids, for determining coal or oil consumption, for measuring horsepower produced; for testing tensile strengths, for determining moisture content, for packing predetermined quantities of materials in containers, for counting quantities of small uniform or duplicate items; for determining the weight of fabrics per square or running yard in ounces; for grading seeds and grains, and for solving many other perplexing problems of testing and measurement in all kinds of industrial plants.

Detailed information concerning the uses and applications of Toledo Scales, and their exclusive features and construction will be given on request.

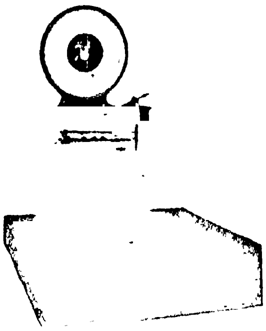
ENGINEERING DEPARTMENT

The Toledo Scale Company makes springless automatic scales and nothing else. Its entire staff of highly skilled scale engineers and factory experts devote their whole time and attention to the building of automatic scales. Their knowledge, skill and services are always available for the solution of weighing, measuring, counting and checking problems.

SERVICE DEPARTMENT

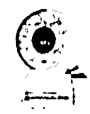
All Toledo Scales are backed by an efficient Service organization which insures Toledo users prompt service at all times in case of accident, or whenever a skilled scale mechanic is required.

A FEW TYPES OF TOLEDO SCALES

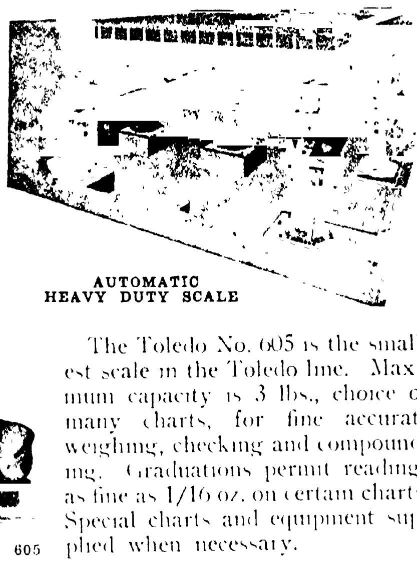


AUTOMATIC SELF-CONTAINED HEAVY DUTY SCALE

Toledo Automatic Self-contained Heavy Duty scale all steel construction, ranges in capacity to a maximum of 6250 lbs. There are six platform sizes, from 48 x 48" to 76 x 54".



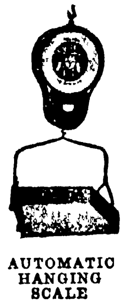
The Toledo Automatic Heavy Duty scale of the built-in type similar to the illustration is furnished in capacities ranging from 6 to 30 tons, with platform sizes running from 5 ft x 5 ft to 22 ft x 9 ft. The dial is 28 inches in diameter at the reading line.



AUTOMATIC HEAVY DUTY SCALE

TOLEDO NO. 605

The Toledo No. 605 is the smallest scale in the Toledo line. Maximum capacity is 3 lbs., choice of many charts, for fine accurate weighing, checking and compounding. Graduations permit readings as fine as 1/16 oz. on certain charts. Special charts and equipment supplied when necessary.

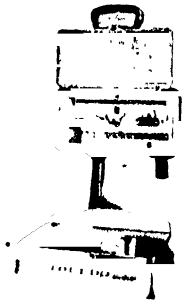


AUTOMATIC HANGING SCALE

The Toledo Automatic Hanging Scale is built in three capacities: 50 lbs., 100 lbs., and 150 lbs., with graduations as fine as 1/10 lb. The scale is hung from a swivel hook which permits its facing in any convenient direction. Choice of equipment is as follows: square galvanized pan, as shown, galvanized scoop; commodity hook; tire hook; round porcelain bowl; and galvanized lap for weighing cotton.

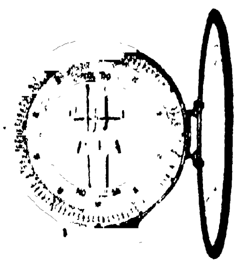
Continued on Next Page

TOLEDO NO. 682 TYPE SCALE
Used in compounding chemicals and rubber at the McGraw Tire and Rubber Co.



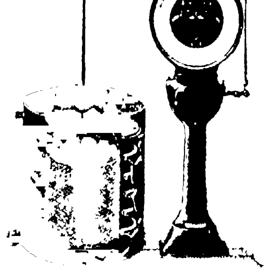
TOLEDO NO. 692 COMPOUNDING SCALE

The Toledo No 692 compounding scale has two beams in an enclosed cabinet with a hinged door One beam has a capacity of 2 lbs. and is graduated to ¼ oz.; the other beam is of 24 lbs. capacity graduated to 2 lbs. or can be increased to 50 lbs. if necessary. The chart has but one graduation in the center By setting the poises on the beams at the weight desired the scale makes possible extremely rapid weighing to this predetermined mark.



TOLEDO COMPOUNDING DIAL

The Toledo compounding dial can be furnished on any of the Toledo scales having 20" dials. At the extreme outer edge of the dial is a circular metal band on which are movable indicators numbered consecutively to represent the ingredients being weighed. The scroll is hinged to permit the setting of these indicators to correspond to the amount of each ingredient called for in the compound.



TOLEDO MOISTURE SCALE

The Toledo Moisture Scale was designed to compute the percentage of moisture contained in raw wool and similar materials The material is placed in a drying tank and is suspended from the scale which registers 100% before drying, indicating in terms of % the shrinkage as the material is dried out.

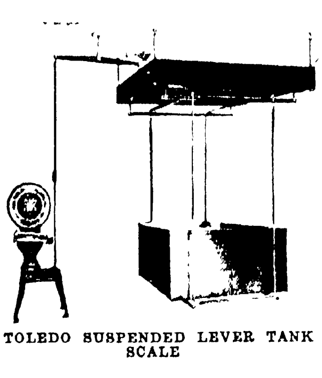
TOLEDO 800 TYPE PORTABLE SCALE
At the Standard Varnish Company, New York, weighing barrels of varnish and oils

AUTOMATIC PORTABLE SCALE

Toledo Automatic Portable Scale is furnished in capacities from 100 to 1500 pounds. It is supplied without beams, with tare beam only, or with both tare and capacity beams. Dial, which is 20" in diameter at reading line, may face platform or may be at right angles to it, or may be on opposite side. Long column as shown, measures 37"; short column for bench work measures 20". Scale is furnished with or without wheels, platform sizes 21 x 29", or 21 x 14".

TOLEDO SELF-CONTAINED SINGLE COLUMN DORMANT SCALE

The Toledo self-contained single column dormant scale is built in capacities from 250 to 3800 pounds, with or without tare and capacity beams, as desired. Dial is 20" in diameter at reading line Platforms run in eight sizes from 46 x 33" to 76 x 54".



TOLEDO SUSPENDED LEVER TANK SCALE

Toledo Suspended Lever Tank Scale single column style head has an extreme capacity of 2500 lbs. With the cabinet head shown in our 1541 type scales the maximum capacity is 6250 lbs A platform may be substituted for the tank Overhead levers may be supported on posts from floor, or hung from ceiling.

TOLHURST MACHINE WORKS

TROY, N. Y.

NEW YORK OFFICE 111 Broadway

WESTERN REPRESENTATIVE
John S. Gage
Hartford Bldg
Chicago, Ill

CANADIAN REPRESENTATIVE
W. J. Westaway Co.
Main & McNab Sts
Hamilton, Ont
400 McGill Bldg
Montreal, P. Q.

SOUTHERN REPRESENTATIVE
Fred H. White
Realty Bldg
Charlotte, N. C.

SAN FRANCISCO REPRESENTATIVE
B. M. Pilhashy
532 Merchants Exchange Building
San Francisco, Calif

PRODUCTS

Tolhurst Centrifugals and Extractors of all types and for all purposes.

- Acid Wringers
- Bottom Discharge Centrifugals
- Center-Slung Centrifugals
- Chip Wringers
- Dehydrating Centrifugals
- Extractors
- Finishing Centrifugals
- Hydro-Extractors
- Laboratory Centrifugals
- Metal Dryers
- Nitrating Centrifugals
- Oil Extractors
- Self-Balancing Centrifugals
- Solid Curb Centrifugals
- Suspended Centrifugals

GENERAL SPECIFICATIONS

Baskets—12 inches to 72 inches inside diameters, with or without bottom discharge

May be made of iron and steel or bronze and copper, etc., or covered with hard rubber or coated with lead, tin, etc.

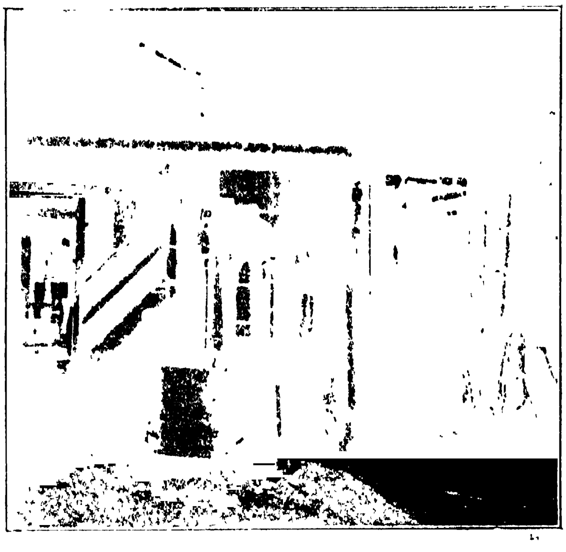
Cases—Of cast iron or iron and steel May be lined with sheet lead, hard rubber, etc

Bearings—The different types of centrifugals require various bearings; some roller type, others ball type. All are flexibly mounted to insure smoothness of operation, durability of bearings and safety.

Drive—By countershaft, engine or motor

SELF-BALANCING CENTRIFUGAL

Illustration shows a Tolhurst Centrifugal installed in a well-known Chemical Plant.

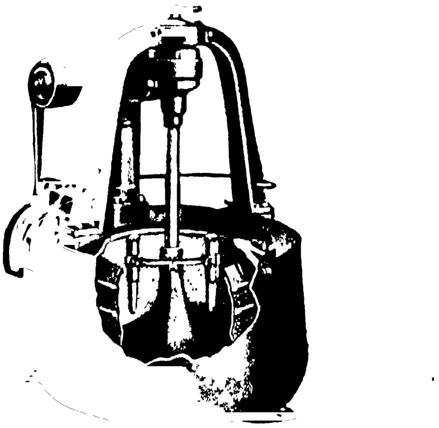


TOLHURST SELF-BALANCING CENTRIFUGAL

Baskets—26 to 72 inches diameter with or without bottom discharge Countershaft, motor or engine drive or by direct connected vertical motor.

LABORATORY CENTRIFUGAL

Specially designed for centrifugal determinations and scientific research The Tolhurst 12" laboratory centrifugal is equipped, if desired, with test tube holders and imperforate baskets for clarification. The basket is large enough (12 inches diameter) to permit the centrifuging of a thick cake, therefore results are comparable with those obtained in the large commercial size centrifugals



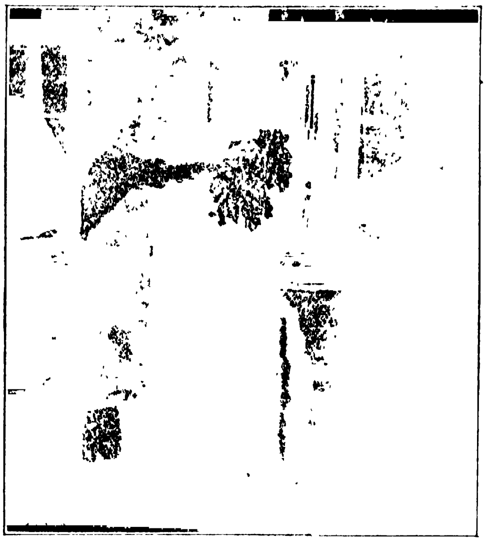
TOLHURST LABORATORY CENTRIFUGAL

LABORATORY INVESTIGATIONS

We make laboratory investigations of centrifugal problems without charge.

CENTER-SLUNG CENTRIFUGAL

An accessible, open-top machine which does not dance in the supporting links, because these links are attached at or near the center of gravity and in line



TOLHURST CENTER-SLUNG CENTRIFUGAL

Baskets—40 and 48 inches inside basket diameters, with or without bottom discharge Drive by countershaft or motor or by direct connected vertical motor.

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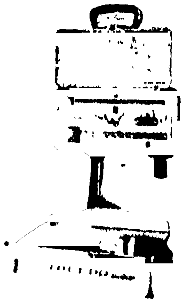
Used in compounding chemicals and rubber at the McGraw Tire and Rubber Co.



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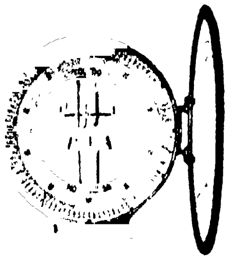
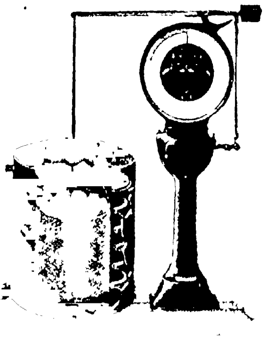
The Toledo compounding dial can be furnished on any of the Toledo scales having 20″ dials. At the extreme outer edge of the dial is a circular metal band on which are movable indicators numbered consecutively to represent the ingredients being weighed. The scroll is hinged to permit the setting of these indicators to correspond to the amount of each ingredient called for in the compound.



TOLEDO COMPOUNDING DIAL



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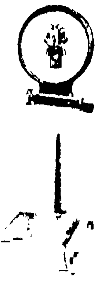
At the Standard Varnish Company, New York, weighing barrels of varnish and oils



AUTOMATIC PORTABLE SCALE

Toledo Automatic Portable Scale is furnished in capacities from 100 to 1500 pounds. It is supplied without beams, with tare beam only, or with both tare and capacity beams. Dial, which is 20″ in diameter at reading line, may face platform or may be at right angles to it, or may be on opposite side. Long column as shown, measures 37″; short column for bench work measures 20″. Scale is furnished with or without wheels, platform sizes 21 x 29″, or 21 x 14″.

The Toledo self-contained single column dormant scale is built in capacities from 250 to 3800 pounds, with or without tare and capacity beams, as desired. Dial is 20″ in diameter at reading line Platforms run in eight sizes from 46 x 33″ to 76 x 54″.

TOLEDO SELF-CONTAINED SINGLE COLUMN DORMANT SCALE

Toledo Suspended Lever Tank Scale single column style head has an extreme capacity of 2500 lbs. With the cabinet head shown in our 1541 type scales the maximum capacity is 6250 lbs A platform may be substituted for the tank Overhead levers may be supported on posts from floor, or hung from ceiling.

TOLEDO SUSPENDED LEVER TANK SCALE

TRENT TILE CO., INC.

Manufacturers of

Floor, Wall and Trim Tile of Every Variety

TRENTON, NEW JERSEY

PRODUCTS

White Glazed Wall Tile and all necessary Trimmers.

Ceramic Mosaic Floor Tile in white and all colors.

FLOOR, WALL AND TRIM TILE

We are Pioneer Manufacturers of Tile in the United States, and we are original manufacturers of Ceramic Mosaic Floor Tile in white and all colors.

USES

Owing to the adaptability and long life of our Glazed Tile products in Industrial plants, they are finding widely increasing and divergent applications. Modern Manufacturing Laboratories and Research Laboratories are built for permanence, and floors built with our Ceramic Mosaic Floor Tile will be clean, resist corrosion, be leak-proof and will last as long as the building. The walls of laboratories lined with our White Glazed Wall Tile and Trimmers are always bright, easily cleaned of dust and chemical stains, are not attached by corrosive liquids, and are non-conductors.

Trent Tile is being used for lining vats in chemical plants where the products must have thorough sanitary surroundings during processing. Among these products are Foods, Pharmaceuticals, Cosmetics, Fruit Juices, Patent Medicines, etc.

Trent Tiles are also used for Factory Libraries, Lunch Rooms, Rest Rooms, Wash Rooms and Lavatories.

EASE OF CLEANING

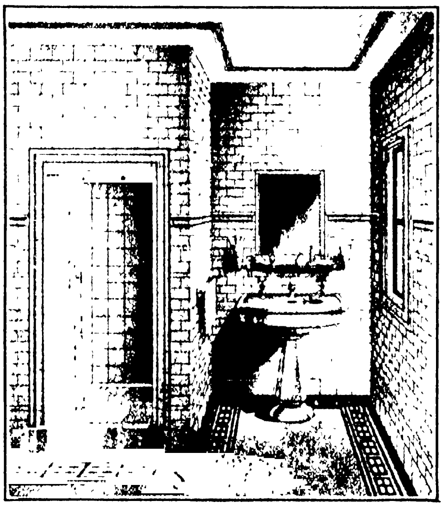
Trent Tile can be cleaned in a very short time, in exactly the same manner as glass, therefore it always appears as when first installed.

SHAPES

Our tile is furnished in all shapes; flats, squares, oblongs, cove and base, in and out corner, etc., in fact any shape or style required to line a tank or vat, finish a laboratory, lavatory, entry, kitchen, etc.

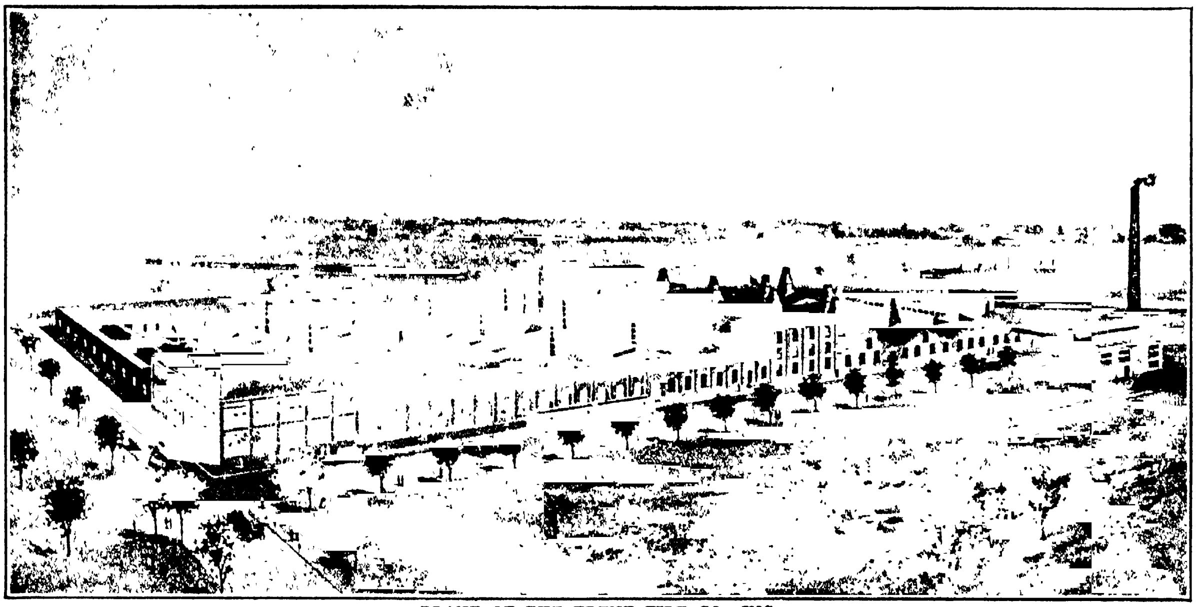
INSTALLATIONS

The Trent Tile Co., Inc., has furnished the Floor and Wall Tile for the Standard Oil Co.'s different refineries, office buildings, etc., throughout the United States. We have also furnished tile for other chemical industrial plants for various purposes.



A MODERN FACTORY WASHROOM

Shower 6 x 6 tiles, Walls 6 x 3 tiles



PLANT OF THE TRENT TILE CO., INC.

THE TRUSCON LABORATORIES

HOME OFFICE AND FACTORY
DETROIT, MICH.
BRANCHES IN ALL PRINCIPAL CITIES

PRODUCTS

Waterproofings and Dampproofings; Concrete Floor Hardeners, Acid-Resisting Paints, and Technical Paints and Enamels for a great variety of purposes.

WATERPROOFING AND DAMPPROOFING

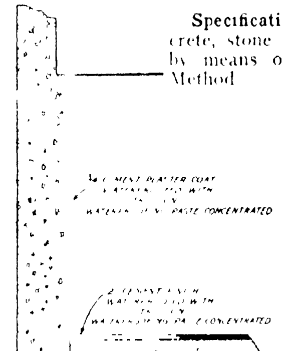
Truscon Waterproofing Paste, Concentrated, is an integral waterproofing for concrete. While very generally used for waterproofing concrete foundations, tunnels, reservoirs, etc., it is also desirable for protecting other forms of masonry constructions, such as brick or stone, against hydrostatic head. (See specifications below.)

Truscon Waterproofing Paste has won its position in the field because it is the perfected waterproofing from a practical engineering point of view. Furthermore, it is the most economical waterproofing to use, it is concentrated; less material is required. Consequently it costs less per cubic yard of concrete.

Specifications—For waterproofing mass concrete by integral method

Applicable to cisterns, reservoirs, foundations and similar concrete structures

Method—Watertightness shall be secured by the addition of Truscon Waterproofing Paste, Concentrated, as manufactured by The Truscon Laboratories, to all water used to temper the dry mixture of cement and aggregate in the proportions specified and as supplied by the manufacturer.



DETAILS PLASTER COAT METHOD

Specifications—For waterproofing concrete, stone and other masonry structures by means of Waterproofed Paster Coat Method

Applicable to cisterns, reservoirs, basement walls, subways and similar structures

Method — Watertightness shall be secured by plastering the interior surfaces of the structure with a continuous coat of Portland Cement mortar waterproofed with Truscon Waterproofing Paste, Concentrated, as manufactured and recommended by The Truscon Laboratories

Truscon Plaster Bond—A special bituminous coating for waterproofing interiors of all exposed walls. Its use provides a continuous dampproofing element in all such walls which perfectly insulates the interior from any evidence of dampness. On application to the surface it is partly absorbed into the pores, thoroughly sealing them and establishing a most inseparable bond.

Truscon Foundation Coat—A liquid bituminous cement of heavy consistency adapted for dampproofing general substructural work under earth filling.

Truscon Stone Backing—A black dampproof coating for treating the unexposed sides of cut stone, thereby preventing discoloration of the stone from elements in the mortar.

TRUSCON MAINTENANCE ENGINEERING SERVICE

TRADE-MARK OF MAINTENANCE DEPARTMENT

"A MAINTENANCE PRODUCT FOR EVERY MAINTENANCE PURPOSE"

Every manufacturing Plant, every Office Building, Hotel, Hospital, Apartment Block, etc., has a definite problem in its maintenance or up keep. Interiors must be painted—exteriors must be protected against deterioration—and there is much varnishing and cleaning up to be done. On account of the exceptional manufacturing facilities of the Truscon Laboratories and our experience in handling such Maintenance Requirements, we are in a position to offer every Architect, Engineer, Building or Plant Superintendent, a valuable Service.

Whether your problem is that of oilproofing a concrete floor, splinterproofing a wood floor, obtaining a special paint to resist some acid or alkali condition, waterproofing a basement, or protecting exposed steel, Truscon Maintenance Engineering Service has a product for that, and every other, Building Maintenance purpose.

Below we enumerate a few standard Truscon products and their particular uses. These are suggestive and we ask that you bear in mind that Truscon Maintenance Engineering Service does not merely furnish Maintenance materials, but is a Service which extends an intelligent, cooperative assistance that results in money saved on your Maintenance Requirements.

Dustless Long-wearing Concrete Floors—are possible with "Agatex," a chemical which hardens the concrete without changing its color or appearance.

Increasing Lighting Efficiency—Nothing does so much toward cutting down electric lighting bills as the use of a serviceable Mill White, such as Truscon "Industrial White." It stays white. It is more economical and advantageous than kalsomine.

Wood Floors do not Splinter or Sliver—if protected with "Truscon Wood Floor Preservative." Gives new life and toughness to a wood floor. Prevents decay and dry rot.

Non-rusting Steel Surfaces—"Bar-Ox Inhibitive Coating" is the coating that should be used on all exposed Steel, such as bridgework, cranes, outdoor tanks, etc., for both shop and field coats

Protecting Masonry—is perfectly feasible with "Stonetex," the Nationally known masonry coating. It dampproofs, protects and beautifies all such surfaces.

Skylight and Window Cleaner—for easy cleaning of soot, rust and grime from glass. Especially useful when applied to ribbed glass. Does not injure the paint or putty.

Truscon Pipe Identification Paint—For Painting the various pipes running along the walls and ceilings of an Industrial Plant in distinctive colors. Obtainable in a standard line of colors for water, gas, steam, oil, compressed air and other pipe lines.

TROY ENGINE & MACHINE COMPANY

Manufacturers of Steam Engines Exclusively

TROY, PA.

PRODUCTS

- **Troy Vertical Automatic Engines.**
- **Troy Horizontal Automatic Engines.**
- **Troy Vertical Throttling Engines, High and Low Pressure Types.**
- **Troy Horizontal Throttling Engines, High and Low Pressure Types.**

HORSE-POWER

Troy Steam Engines can be supplied in capacities from 2 to 200 Horse-power. The ratings given in our tables are not indicated powers, but brake powers, or the net effective powers delivered at the belt or the shaft coupling.

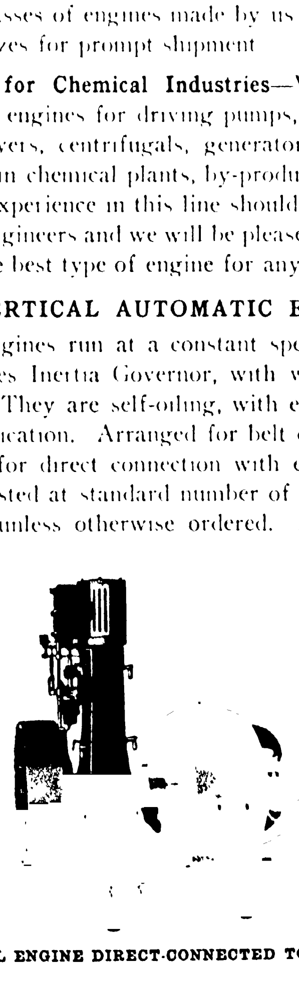
FACILITIES AND EXPERIENCE

Troy Steam Engines are the result of over 28 years' experience in engine building. Our plant is located near the Pennsylvania iron and coal fields, where raw material is most favorably secured. We endeavor to keep all classes of engines made by us in stock in all standard sizes for prompt shipment.

Engines for Chemical Industries—We have supplied many engines for driving pumps, blowers, fans, mixers, dryers, centrifugals, generators and similar equipment in chemical plants, by-product coke plants, etc. Our experience in this line should be of value to chemical engineers and we will be pleased to advise regarding the best type of engine for any such purpose.

TROY VERTICAL AUTOMATIC ENGINES

These engines run at a constant speed determined by the Rites Inertia Governor, with which they are equipped. They are self-oiling, with enclosed frame, or cup lubrication. Arranged for belt drive with two wheels or for direct connection with extension base. Speed adjusted at standard number of revolutions, as per table, unless otherwise ordered. All fittings of best grade.



VERTICAL ENGINE DIRECT-CONNECTED TO GENERATOR

TROY VERTICAL AUTOMATIC ENGINES

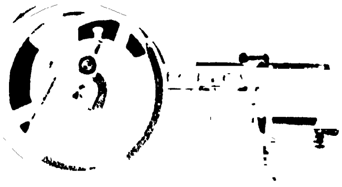
Specifications for Enclosed Self-Oiling or Cup Lubrication

Cylinder		Revolutions			Brake horse-power ¼ cut off		Gov. wheel and driving pulley			Shaft		Pipes		Floor space, inches	Approx shipping weight	
† Diameter	Stroke	Lowest	Standard	Highest	100 lbs. press. 300 revs.	One lb. press. One rev.	Diameter	Face	Weight of wheel	Diameter	Length	Supply	Exhaust	Belted engine two wheels	Belted engine two wheels	D C engine extended base
3½	4	400	400	600	†2 96	000074	20	3½	150	1⅜	22⅝	¾	1	20x33	750	950
4½	5	400	400	600	16 44	000161	24	4½	175	1⅝	27	1	1¼	24x27	950	1150
5	7	300	300	500	9 36	000312	30	6½	415	2⅛	32⅞	1¼	1½	31x33	1850	2100
6	7	300	300	500	13 35	000449	30	6½	415	2⅛	32⅞	1½	2	31x33	1900	2200
7	7	300	300	500	18 36	000612	30	6½	415	2⅜	32⅞	2	2	31x33	1980	2250
7	8	300	300	475	20 97	000699	36	8½	610	3	39⅜	2	2	36x41	2900	3200
8	8	300	300	450	27 39	000913	36	8½	610	3	39⅜	2	2½	36x41	2960	3250
9	9	275	300	450	39 03	001301	40	9½	930	3½	46	2½	3	40x48	4300	5000
9	10	275	300	400	43 20	001440	44	10½	1050	4	53	3	4	44x53	5200	6000
10	10	275	300	400	53 52	001784	44	10½	1050	4	53	3	4	44x53	5400	6800
11	10	275	300	400	64 74	002158	44	10½	1050	4	53	3	4	44x53	5600	7000
10	12	275	300	350	64 26	002142	54	12½	1500	5	57⅜	4	5	54x62	8200	9700
12	12	275	300	350	92 52	003084	60	12½	1700	5	57⅜	4	5	60x62	8700	10200
14	14	225	250	300	122 42	004807	60	14½	2250	7	76	4½	6	60x76	16000	18000

†Horse-power based upon 400 R. P. M.

TROY HORIZONTAL AUTOMATIC ENGINES

Two methods of lubrication, self-oiling or tank gravity system. Steam pressures, 60 to 160 pounds, special cylinders built for higher pressures. Sub-base is used with self-oiling engines as it contains the oil reservoir and some fittings. Full equipment. Speed and direction of rotation should be specified.



HORIZONTAL AUTOMATIC ENGINE

TROY HORIZONTAL AUTOMATIC ENGINES

Specifications for Enclosed, Self-Oiling or Tank Lubrication

Cylinder		Revolution			Brake horse power ¼ cut-off		Gov. wheel and driving pulley			Shaft		Pipes		Floor space, inches	Approx shipping weight	
Diameter	Stroke	Lowest	Standard	Highest	100 lbs press 300 revs	One lb press. One rev	Diameter	Face	Weight of wheel	Diameter	Length	Supply	Exhaust	Belted engine two wheels	Belted engine two wheels	D C engine extended base
7	8	300	300	475	20 97	000699	36	8½	610	3	39⅜	2	2	41x72	3750	3900
8	8	300	300	450	27 39	000913	36	8½	610	3	39⅜	2	2½	41x72	3800	3950
9	9	275	300	450	39 03	001301	40	9½	930	3½	46	2½	3	47x82	5600	6800
9	10	275	300	400	43 20	001440	41	10½	1050	4	53	3	4	53x89	6400	8100
10	10	275	300	400	53 52	001784	44	10½	1050	4	53	3	4	53x89	6600	8300
11	10	275	300	400	64 74	002158	44	10½	1050	4	53	3	4	53x89	6800	8500
10	12	275	300	350	64 26	002142	54	12½	1500	5	57⅜	4	5	62x105	9600	11000
12	12	275	300	350	92 52	003084	60	12½	1700	5	57⅜	4	5	62x105	10000	11200
14	14	225	250	300	122 42	004897	60	14½	2250	7	76	4½	6	76x123	18000	20000

RITES INERTIA GOVERNOR

This device is incorporated with all our Automatic Engines to regulate the speed. We have found it simple and reliable. Its distinctive features are: Perfect balance. Weight structure consists of a single cast arm, swinging about a common supporting pin and carrying an eccentric across shaft between a longer and shorter cut-off. Regulation and stability obtained by weighting arm at one or both ends and by adjustment of coil spring. Variation between no load and full load seldom exceeds 2%.

Continued on Next Page

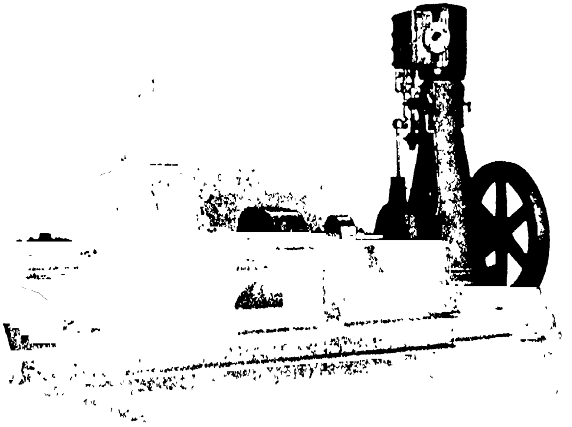
TROY VERTICAL THROTTLING ENGINES

For belted drive or direct connection. This engine makes a very desirable power unit for driving fans, blowers, pumps, etc., and occupies little space. For pump service a heavy balance wheel is supplied.

Balance slide valves are standard in all sizes. Special cylinders and special packing can be supplied for pressures exceeding 160 pounds or for superheat. Engines are self-oiling, or oil cup lubrication. Full equipment supplied. Also built duplex or in pairs to suit customers.

LOW PRESSURE THROTTLING ENGINES

Where it is necessary or desirable to obtain power from low steam pressures Troy Low Pressure Engines will give excellent service. They will use steam at from 10 to 35 pounds pressure, and the cylinders stand a safety test several times greater. Built in vertical and horizontal types.

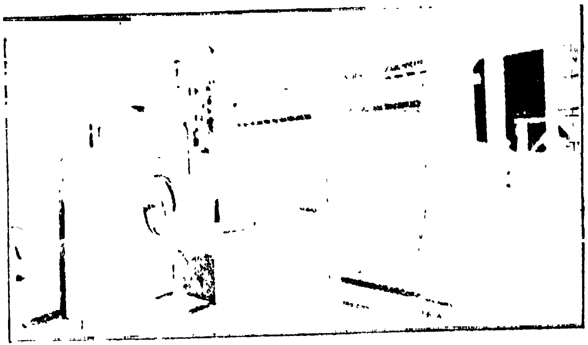


VERTICAL ENGINE DRIVING POSITIVE PRESSURE BLOWER

TROY VERTICAL THROTTLING ENGINES

Specifications for Self Oiling or Cup Lubrication

Cylinder			Brake Horse-power ¾ Cut-off		Flywheel		Shaft		Pipes		Floor Space Inches	Approx. Ship Weight
Diameter	Stroke	Revolutions	90 Lbs Steam Press	1 Lb Press 1 Rev	Diameter	Face	Diameter	Length	Supply	Exhaust	Engine with Stand Pump	Engine with Stand Pulley
				High Pressure Type								
3¼	4	300	2.21	000082	16	3½	1⅜	23¼	¾	1	20x23	500
4¼	5	300	4.81	000178	20	4½	1⅝	20⅞	1	1¼	24x30	750
5	7	250	7.80	000346	26	6½	2⅜	36	1¼	1½	31x36	1380
6	7	250	11.20	000499	26	6½	2⅜	36	1¼	1½	31x36	1460
7	7	250	15.34	000682	26	6½	2⅜	36	1½	2	31x36	1550
7	8	250	17.32	000770	36	8½	3	42¾	2	2	35x43	2300
8	8	250	22.80	001014	36	8½	3	42¾	2	2½	36x43	2500
9	9	250	32.40	001440	40	9½	3½	53	2½	3	40x49	3800
9	10	250	36.00	001600	44	10½	4	57	3	4	44x56	4400
10	10	250	44.55	001980	44	10½	4	57	3	4	44x56	4600
11	10	250	54.00	002400	44	10½	4	57	3	4	44x56	4800
10	12	250	53.55	002880	54	12½	5	64⅜	3	5	54x68	6800
12	12	250	77.10	003427	54	12½	5	64⅜	3½	5	54x68	7000
14	12	250	102.44	004664	54	12½	5	64⅜	4	5	54x68	7300
14	14	225	122.42	005441	60	14½	7	66	4	6	60x68	13500
16	14	225	160.00	007108	60	14½	7	66	5	7	60x68	13900
				Low Pressure Type								
8	5	250	3.15	00063	20	4½	1⅝	20⅞	1½	2	23x30	950
10	7	250	6.50	00130	26	6½	2⅜	36	2	2½	31x36	1800
12	7	250	9.50	00190	26	6½	2⅜	36	2½	3	31x36	2000
14	7	250	13.50	00272	26	6½	2⅜	36	3	3½	31x36	2400
12	8	250	11.40	00228	36	8½	3	42⅞	3	3½	36x43	3000
15	8	250	17.65	00353	36	8½	3	42⅞	3	3½	36x43	3200
12	9	250	12.85	00257	40	9½	3½	53	3	4	40x53	4000
18	9	250	28.90	00578	40	9½	3½	53	4½	6	40x53	4600
15	10	250	22.30	00446	44	10½	4	57	3½	4	44x57	5000
16	12	250	30.45	00609	54	12½	5	64⅜	4	5	54x68	7600
18	12	250	38.50	00770	54	12½	5	64⅜	5	7	54x68	7800



VERTICAL ENGINE DRIVING FAN

TROY HORIZONTAL THROTTLING ENGINES

Sizes from 15 horse-power up, as per table below. Massive frame and base. Special bases can be supplied for direct-connected units. Self-oiling system or tank gravity lubrication. Left-hand engines standard. We build special equipment for driving blowers, fans, pumps, compressors, etc.

Like our Vertical Throttling Engines, these engines come also in a low pressure type, for use if it is necessary to utilize steam at from 10 to 35 pounds pressure.

TROY HORIZONTAL THROTTLING ENGINES

Specifications for Self Oiling or Tank Lubrication

Cylinder			Brake Horse-power ¾ Cut-off		Flywheel		Shaft		Pipes		Floor Space, Inches	Approx. Ship Weight
Diameter	Stroke	Revolutions	90 Lbs Steam Press	1 Lb Press 1 Rev	Diameter	Face	Diameter	Length	Supply	Exhaust	Engine with Stand Pump	Engine with Stand Pulley
				High Pressure Type								
7	8	250	17.32	000770	36	8½	3	42¾	2	2	43x72	3300
8	8	250	22.80	001014	36	8½	3	42¾	2	2½	43x72	3400
9	9	250	32.40	001440	40	9½	3½	53	2½	3	53x82	4700
9	10	250	36.00	001600	44	10½	4	57	3	4	57x89	5600
10	10	250	44.55	001980	44	10½	4	57	3	4	57x89	5800
11	10	250	54.00	002400	44	10½	4	57	3	4	57x89	6000
10	12	250	53.55	002880	54	12½	5	64⅜	3	5	65x105	7800
12	12	250	77.10	003427	54	12½	5	64⅜	3½	5	65x105	8000
14	12	250	102.44	004664	54	12½	5	64⅜	4	5	65x105	8200
14	14	225	122.42	005441	60	14½	7	66	4	6	66x123	15000
16	14	225	160.00	007108	60	14½	7	66	5	7	66x123	15400
				Low Pressure Type								
12	8	250	11.40	00228	36	8½	3	42⅞	3	3½	43x73	3800
15	8	250	17.65	00353	36	8½	3	42⅞	3	3½	45x73	4000
12	9	250	12.85	00257	40	9½	3½	53	3	4	54x82	5000
18	9	250	28.90	00578	40	9½	3½	53	4½	6	56x82	5200
15	10	250	22.30	00446	44	10½	4	57	3½	4	57x90	6200
16	12	250	30.45	00609	54	12½	5	64⅜	4	5	65x106	8600
18	12	250	38.50	00770	54	12½	5	64⅜	5	7	65x106	8800

GUARANTEE

Each engine is guaranteed to perform its service, careful usage being imposed, including clear oil and steam passages, good lubrication and intelligent adjustment. Any parts proving defective (subject to manufacturers' inspection) within one year from date of shipment will be replaced by us.

The success which has attended our engines during the twenty-eight years we have been specializing in small engines warrants us in promising durable, simple equipment which will not require frequent repairing or replacement—qualities which recommend our engines for industrial chemical plants.

TURNER, HALSEY CO.

62 Leonard Street

NEW YORK, N. Y.

BRANCHES

Baltimore Boston Philadelphia Chicago St Louis New Orleans San Francisco

SALES AGENT FOR

MT. VERNON-WOODBERRY MILLS, INC.

PRODUCTS

- Filter Cloths
- Paper Mill Dryer Felts
- Cotton Duck

VARIETY

From an extremely fine, closely woven fabric for fine filtering processes, Mt. Vernon-Woodberry brands range to the coarse, less closely woven cloths suited to refining that is not of a high grade. Any Filter Cloth, if the proper width is not in stock, will be made up in whatever width the customer requires for his particular press, or, if no one of the standard fabrics meets perfectly his special requirements, the mills will be not only willing but anxious to experiment with new and additional constructions that will insure absolutely satisfactory results. Packed in rolls of about 100 yards.

STANDARD ROLL OF FILTER CLOTH

DELIVERIES

Deliveries, even of special orders, can be made promptly because of the great production facilities of the Mt. Vernon-Woodberry Mills. Samples and further information on request.

APPLICATIONS

Any industry whose processes require the use of Filter Cloth can select from among the Mt. Vernon-Woodberry brands precisely the grade and character of cloth which fulfils its requirements most exactly. These Filter Cloths are now employed in the processes for:

- Alkali
- Beet Sugar
- Borax
- Cane Sugar
- Chemicals
- Cider
- Clay
- Dyestuffs
- Fruit Juices
- Guncotton
- Metallurgical Products
- Oils
- Paint and Pigments
- Paraffine Wax
- Starch
- Varnish
- Whiting
- Etc.

THE TWITCHELL PROCESS COMPANY

CINCINNATI, OHIO

PRODUCTS

Kontakt Saponifiers for use in the Twitchell Process for splitting Fats and Oils.

Kontakt Saponifier for High Grade Fats.

Kontakt D. P. Saponifier for Fats which are subsequently to be distilled. This Reagent is supplied in two forms, Acid and Neutral The Acid form is supplied only in barrels, and is ready for use. The Neutral form is supplied on a bulk basis, and may be shipped in tank cars. It is necessary to acidulate this form before it is ready for use.

THE TWITCHELL PROCESS

Description. The Process consists in boiling Fats and Oils (Glycerides) with water to which has been added a small quantity of the splitting Reagent, or Saponifier, and a small quantity of Sulphuric Acid.

The Saponifier decomposes the Fat from which the Glycerine separates and dissolves in the water, which, when boiling is discontinued, quickly settles to the bottom of the tub. After neutralizing the Glycerine solution can be evaporated down to crude glycerine, and the highest quality of dynamite and C. P. Glycerine can be made from it.

Fatty Acids from which the Glycerines have been separated may be manufactured into soap by direct combination in the soap kettle, or mixer, or may be worked up by panning and pressing into Stearic Acid and Red Oil.

Equipment—All the apparatus necessary for carrying out the Process are lead- or copper-lined tubs, for acid-boiling the Fats before splitting, and wooden tubs in which the decomposition is carried out. The tubs must be of sufficient size to handle the desired quantity of Fatty Acid. The expense of installation is small, as compared with splitting with any other means, and it is the only process by which bulk quantities can be handled. This brings about considerable saving in the labor and steam required.

Advantages—The important advantages of the Twitchell Process over other processes for Glycerine recovery are:

(1) A higher percentage of yield of Glycerine of better quality is obtained at a lower cost per unit.

(2) Absolute safety to workmen and property prevails throughout the entire operation, no high steam pressures are employed

(3) By employing Fatty Acids for soap-making, a saving of time, labor, steam and alkali is effected, together with saving of chemicals used for treating spent soap lyes, as compared with direct alkali saponification of the original fats.

(4) Very large quantities of fats may be decomposed in a single operation with low operating costs.

(5) The plant employed is extremely simple and inexpensive in character and its operation may be quickly learned by any workman of ordinary intelligence.

(6) The quality of Stearic Acid obtainable by properly pressing the Fatty Acids produced by the Twitchell Process is unexcelled.

Application—Large quantities of low grade Fats are annually reclaimed for purposes of soap and candle making, by distillation Before this operation can be successfully carried out, it is necessary that the Glycerine be separated from these Fats in order to avoid formation of excessive amounts of hydrocarbons and of pitch when the Fats are heated to the high temperature required to distil them Crude Fatty Acids, obtained from low grade materials by means of the Twitchell Process and the Kontakt D. P. Saponifier, contain less Glycerine and consequently work more freely through the still; the distillate comprises a higher percentage of clean Fatty Acids, and lower yields of Pitch are obtained than is the case with crude Fatty Acids which have been prepared from similar materials by autoclaves

INFORMATION

Through our Chemical Service Department we shall be glad to provide further information concerning the practical application of the Twitchell Process with Kontakt Saponifiers, and possibilities in connection with the use of Fatty Acids for the manufacture of Soap and Stearic Acid and Red Oil.

Check FUEL WASTE
Trade Mark

UEHLING INSTRUMENT COMPANY

2107 EMPIRE BLDG., NEW YORK, N. Y.

Boston
Chicago
Cable Address
"UEHLINCO," New York

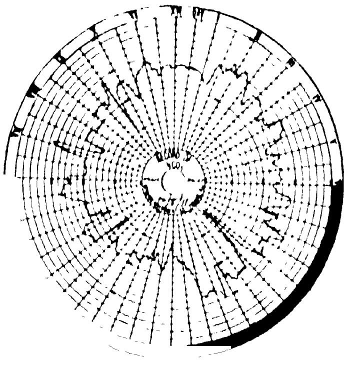
PRODUCTS

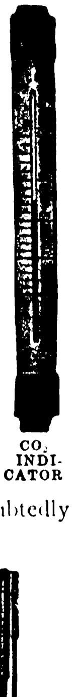
Fuel Economy Apparatus, Instruments for Measuring and Recording CO_2, Temperature, Draft, Differential Draft, Pressure, Differential Pressure, Absolute Pressure, Barometric Pressure, etc.

UEHLING CO_2 RECORDING EQUIPMENT

This equipment consists of the instrument proper which can be located in any convenient part of the plant, the CO_2 recording gauge which can be located in the office of the chief engineer or superintendent, and the auxiliary CO_2 indicator which can be located at the furnace front for the guidance of the fireman or attendant, who thereby can be held responsible for the record produced.

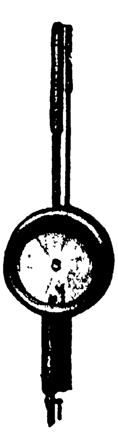
CO_2 RECORDER


CONTINUOUS CO_2 RECORD (NOT INTERMITTENT). MADE ON 8-INCH CHART
No Chemical Solutions


CO_2 INDICATOR

The subject of combustion efficiency is undoubtedly one of the most important before the engineer, and it is through the above equipment that we are able to provide a means for keeping continuous tabs on the fuel wasted up the chimney.

Uehling CO_2 Recording Equipment eliminates the use of springs, multiplying levers, rubber hose connections, automatic cocks, glassware and corrosive liquids, all of which elements are a source of trouble. Send for our Bulletin 111, also Booklet entitled "Combustion and the Cost of Power."

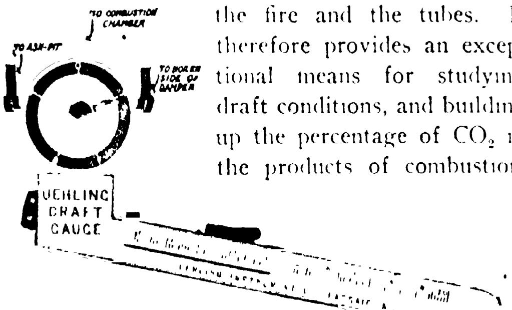

COMBINED BAROMETER AND VACUUM RECORDER

UEHLING COMBINED BAROMETER AND VACUUM RECORDER

This instrument will put a record of both the vacuum and barometric pressures on the same chart, and is therefore of particular value when applied to condensing plants or the measurement of any other vacuum, where it is of importance to compensate for any change in barometric pressure. In this recorder the difference between the two records always represents the absolute pressure.

UEHLING DRAFT ANALYZER

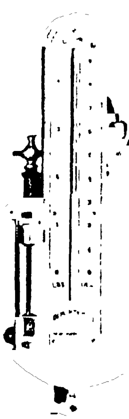
This instrument when connected as shown will measure the resistance through the fire bed, the resistance through the tubes and the combined resistance through the fire and the tubes. It therefore provides an exceptional means for studying draft conditions, and building up the percentage of CO_2 in the products of combustion.



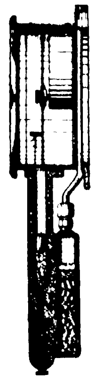
UEHLING DRAFT ANALYZER
A Most Important Adjunct to Boiler Room Equipment

UEHLING ABSOLUTE PRESSURE INDICATOR

This instrument will measure absolute pressure in pounds per square inch and inches of mercury head and is entirely independent of any change in barometric pressure. It is therefore most reliable and accurate in vacuum determinations.


ABSOLUTE PRESSURE INDICATOR

UEHLING RECORDING INSTRUMENTS


PRESSURE RECORDER

All Uehling Recording Instruments are based on the hydrostatic principle as indicated by the sectional cut. It is this principle which in itself guarantees absolute accuracy and makes it possible to eliminate the use of springs, levers and joint movements which are invariably a source of change in calibration due to variable friction and molecular construction of the material used.

We are also prepared to build instruments for special purposes.

THE TWITCHELL PROCESS COMPANY

CINCINNATI, OHIO

PRODUCTS

Kontakt Saponifiers for use in the Twitchell Process for splitting Fats and Oils.

Kontakt Saponifier for High Grade Fats.

Kontakt D. P. Saponifier for Fats which are subsequently to be distilled. This Reagent is supplied in two forms, Acid and Neutral The Acid form is supplied only in barrels, and is ready for use. The Neutral form is supplied on a bulk basis, and may be shipped in tank cars. It is necessary to acidulate this form before it is ready for use.

THE TWITCHELL PROCESS

Description. The Process consists in boiling Fats and Oils (Glycerides) with water to which has been added a small quantity of the splitting Reagent, or Saponifier, and a small quantity of Sulphuric Acid.

The Saponifier decomposes the Fat from which the Glycerine separates and dissolves in the water, which, when boiling is discontinued, quickly settles to the bottom of the tub. After neutralizing the Glycerine solution can be evaporated down to crude glycerine, and the highest quality of dynamite and C. P. Glycerine can be made from it.

Fatty Acids from which the Glycerines have been separated may be manufactured into soap by direct combination in the soap kettle, or mixer, or may be worked up by panning and pressing into Stearic Acid and Red Oil.

Equipment—All the apparatus necessary for carrying out the Process are lead- or copper-lined tubs, for acid-boiling the Fats before splitting, and wooden tubs in which the decomposition is carried out. The tubs must be of sufficient size to handle the desired quantity of Fatty Acid. The expense of installation is small, as compared with splitting with any other means, and it is the only process by which bulk quantities can be handled. This brings about considerable saving in the labor and steam required.

Advantages—The important advantages of the Twitchell Process over other processes for Glycerine recovery are:

(1) A higher percentage of yield of Glycerine of better quality is obtained at a lower cost per unit.

(2) Absolute safety to workmen and property prevails throughout the entire operation, no high steam pressures are employed

(3) By employing Fatty Acids for soap-making, a saving of time, labor, steam and alkali is effected, together with saving of chemicals used for treating spent soap lyes, as compared with direct alkali saponification of the original fats.

(4) Very large quantities of fats may be decomposed in a single operation with low operating costs.

(5) The plant employed is extremely simple and inexpensive in character and its operation may be quickly learned by any workman of ordinary intelligence.

(6) The quality of Stearic Acid obtainable by properly pressing the Fatty Acids produced by the Twitchell Process is unexcelled.

Application—Large quantities of low grade Fats are annually reclaimed for purposes of soap and candle making, by distillation Before this operation can be successfully carried out, it is necessary that the Glycerine be separated from these Fats in order to avoid formation of excessive amounts of hydrocarbons and of pitch when the Fats are heated to the high temperature required to distil them Crude Fatty Acids, obtained from low grade materials by means of the Twitchell Process and the Kontakt D. P. Saponifier, contain less Glycerine and consequently work more freely through the still; the distillate comprises a higher percentage of clean Fatty Acids, and lower yields of Pitch are obtained than is the case with crude Fatty Acids which have been prepared from similar materials by autoclaves

INFORMATION

Through our Chemical Service Department we shall be glad to provide further information concerning the practical application of the Twitchell Process with Kontakt Saponifiers, and possibilities in connection with the use of Fatty Acids for the manufacture of Soap and Stearic Acid and Red Oil.

UNION STEAM PUMP COMPANY

Pumping Machinery, Compressors, Condensers

FACTORY AND MAIN OFFICES, BATTLE CREEK, MICH., U. S. A.

SALES AND SERVICE REPRESENTATIVES IN ALL THE PRINCIPAL CITIES

PRODUCTS

Union Simplex and Duplex Steam and Power Pumps.

Centrifugal Pumps.

Condensers.

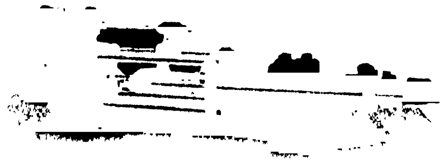
Air Compressors.

PLANT OF UNION STEAM PUMP CO, BATTLE CREEK, MICH.

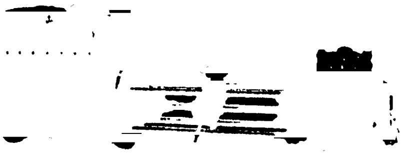
DUPLEX POWER PUMP

DUPLEX BOILER FEED PUMP

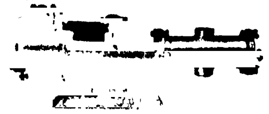
SIMPLEX BOILER FEED PUMP



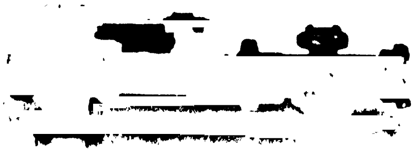
HYDRAULIC PRESSURE PUMP



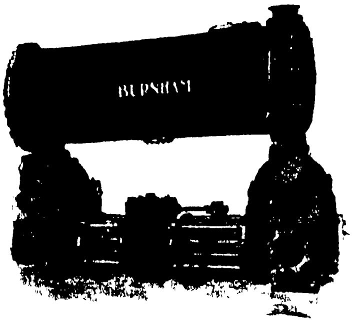
WET VACUUM PUMP



ACID PUMP

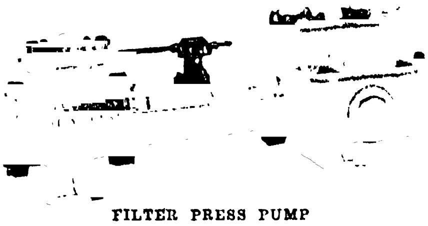


MAGMA PUMP



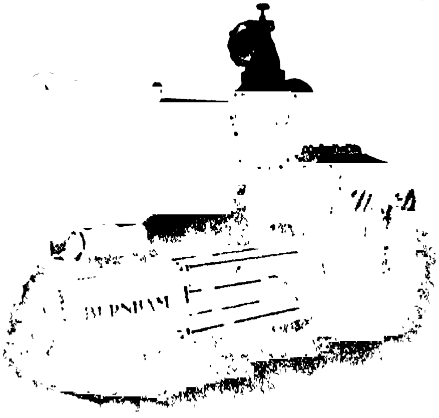
SURFACE CONDENSER

POWER WET VACUUM PUMP

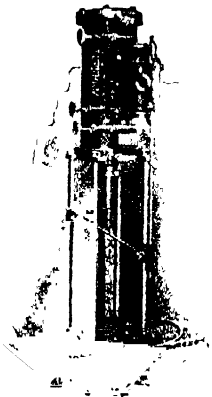


FILTER PRESS PUMP

CONDENSATION PUMP



JET CONDENSER



DEEP WELL PUMP

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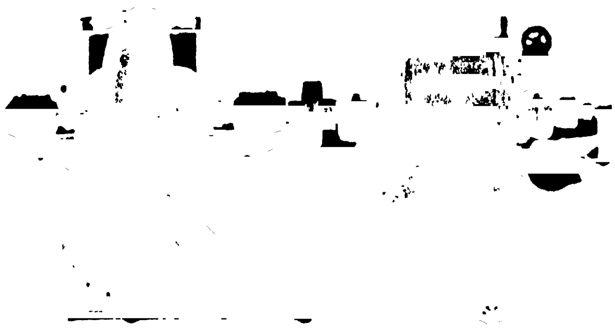
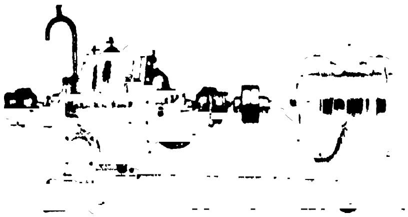


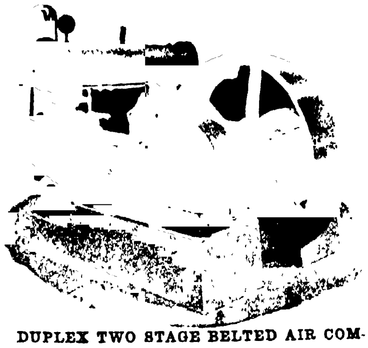
SINGLE STAGE DOUBLE SUCTION CENTRIFUGAL PUMP



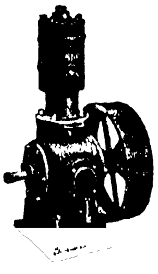
MULTISTAGE CENTRIFUGAL PUMP

SINGLE SUCTION CENTRIFUGAL PUMP

DUPLEX CROSS COMPOUND TWO STAGE AIR COMPRESSOR

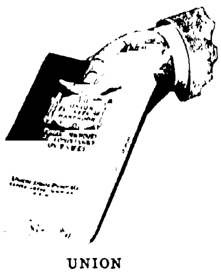


DUPLEX TWO STAGE BELTED AIR COMPRESSOR



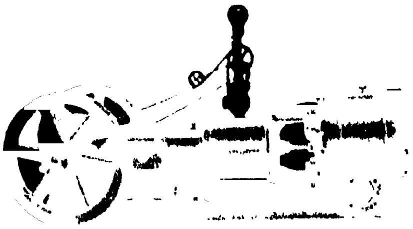
SINGLE VERTICAL AIR COMPRESSOR

DUPLEX VERTICAL AIR COMPRESSOR



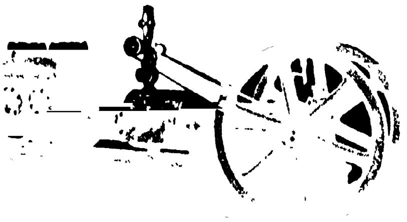
UNION ENGINEERING HAND BOOK

The only hand book published devoted exclusively to engineering data and tables for calculating air compressors, centrifugal pumps, condensers and steam and power pumps. Send for copy.

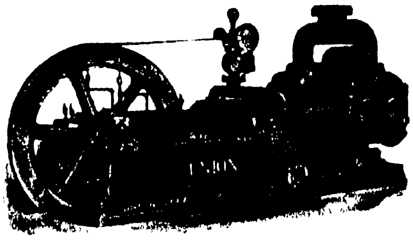


STEAM DRIVEN DRY VACUUM PUMP

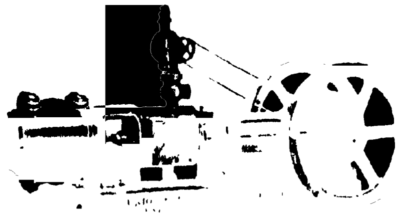
DUPLEX STEAM DRIVEN DRY VACUUM PUMP



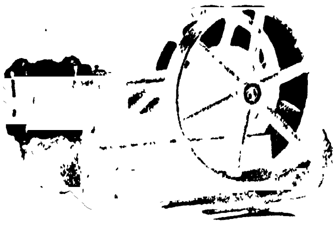
CRANK AND FLYWHEEL WET VACUUM PUMP



DUPLEX CRANK AND FLYWHEEL WET VACUUM PUMP



STEAM DRIVEN AIR COMPRESSOR



BELT DRIVEN AIR COMPRESSOR

UNITED FILTERS CORPORATION

Manufacturers of

Industrial Filters and Metallic Filter Cloth

MAIN OFFICE AND WORKS, HAZLETON, PA.

New York Chicago Salt Lake City San Francisco Los Angeles

Cable Address "UNIFILTER," New York Codes BENTLEY'S WESTERN UNION 5 Letter

PRODUCTS

Pressure Leaf Type Filters, Continuous Vacuum Type Filters, Filter Presses (Recessed and plate and frame types), Filters of special metal construction, Laboratory Filters, Metallic Filter Cloth and Cotton Filter Cloth.

Also Pumps, etc.

INDUSTRIAL USES OF UNITED FILTERS EQUIPMENT

United Filters Equipment is in use in practically every industry having filtration work in the United States. This equipment is used principally in the following industries:

- Beet Sugar
- Cane Sugar (factories and refineries)
- Chemicals
- Pigments and colors
- Dyestuffs
- Soft drinks
- Near beer
- Flavoring extracts
- Mining (cyanide and flotation concentrates)
- Oils (animal, vegetable and mineral)
- Industrial waste water
- Pulp and Paper
- Soap
- Glycerine
- Coal tar Chemicals
- Starch
- Food products, miscellaneous
- Glucose
- Potash
- Metallurgical preparations
- Pharmaceutical preparations
- Cement
- Insecticides

SWEETLAND'S PATENT METALLIC FILTER CLOTH

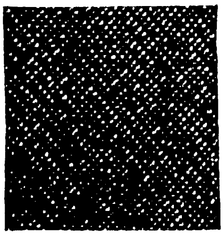


FIG. 1—SWEETLAND'S PATENT METALLIC FILTER CLOTH

This patented fabric is made up regularly in monel metal, which is alkali proof, resistant to most dilute acids, fireproof, many times as strong as ordinary filter fabrics, easy to handle and easy to clean. It will filter chemicals that would cause most fabrics to disintegrate rapidly, and will last many times as long as the ordinary run of filter cloths. A sample will be sent on request to enable prospective purchasers to prove this statement. Its strength, ruggedness and flexibility can be tested by bending back and forth—no spreading of the wires will occur.

Employed as a filter medium in chemical, sugar and oil industries; used in many Sweetland Filters, continuous filters, plate and frame filters, as well as for tank bottoms, centrifugals, etc.

Carried regularly in stock in monel metal in 24, 30, and 36-in. widths. Made to order in special widths in monel, phosphor bronze, brass, etc.

THE AMERICAN CONTINUOUS FILTER

In these machines filtration is carried on by means of a vacuum which induces a flow of filtrate to the discharge. The filter elements are heavy screen or corrugated wood discs divided into sectors. They are mounted perpendicular to a horizontal shaft provided with longitudinal passageways which connect to all leaf sectors in the same phase of rotation.

FIG. 2—AMERICAN CONTINUOUS FILTER

The lower half of the filter leaves dip into the sludge or pulp which is held in a semicircular pan, one side of which is cut away between each filter leaf to provide space for the cake discharge. The vacuum, maintained on the interior of the discs through connections inside the shaft, draws the filtrate through the cloth. Solid matter cakes to the discs and dries during part of a revolution. It is then detached by scrapers, aided by compressed air which inflates each section as it nears the scraper. The cake drops through the space which is left between each disc by the cutting away of the pulp pan and is caught in a suitable conveyor. When the solids are to be washed, a spray washing mechanism is provided.

The operation is continuous, each leaf sector passing in turn through a period of filtering, washing, drying and discharging. Speed of rotation varies, according to the material being handled, from one revolution every fifteen minutes to one every minute.

Advantages of American Continuous Filter—This design permits the installation of a much greater filter area in the same floor space than is possible with other types of suction filters. Huge diameters are unnecessary and the filter requires little head room. Filter cloth is thoroughly cleaned at each revolution, thus a maximum capacity per unit of filter area is maintained. Ample drainage is provided from the filter leaves, insuring a dry cake. Any single leaf sector can be removed and recovered, thus eliminating long shutdowns for redressing. The sectionalized design facilitates transportation and erection of this equipment in remote parts of the country. The filter weighs less per unit of filter area than any other type of vacuum filter.

SIZES OF AMERICAN CONTINUOUS FILTERS

Type	Approx Filter Area	Diam of Discs	No of Discs	No of Sectors per Disc	Disc Spacing	Approx Floor Space Width	Approx Floor Space Length	Head Room	Shipping Weight
4-1	22	4'	1	8	11"	5'9 x	3'9"	5'	900
4-6	130	4'	6	8	11"	5' x	8'7"	5'	3900
6-2	90	6'	2	10	14"	8'6" x	5'6"	8'	6200
6-12	540	6'	12	10	14"	8'6" x	19'2"	8'	15700
8-2	180	8'6"	2	10	18"	7'11" x	9'8"	9'8"	10000
8-6	540	8'6"	6	10	18"	13'11" x	9'8"	9'8"	15100

Table shows only extreme sizes. Intermediate sizes are also made. We are prepared to supply larger units with discs as great as 14 ft. in diameter.

* 14" spacing is employed when solids are to be washed.

KELLY AND SWEETLAND PRESSURE FILTERS, LEAF TYPE

These filters are so designed that the solids are not deposited in a chamber but are built up in an even layer upon the outside surfaces of a plurality of filter leaves mounted within a pressure shell and so spaced that adjacent cakes of solids do not touch each other.

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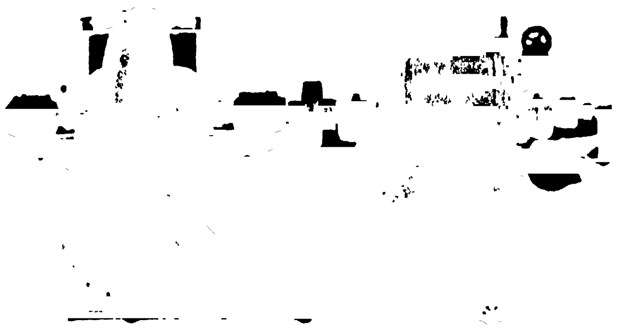
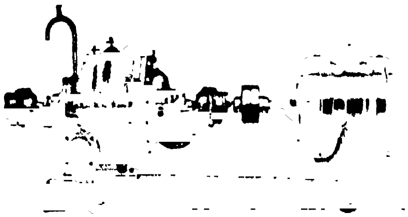
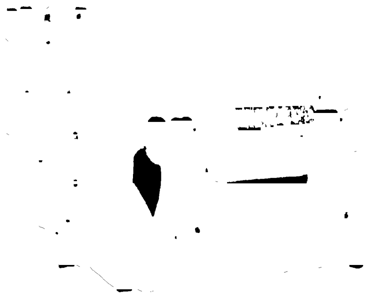


SINGLE STAGE DOUBLE SUCTION CENTRIFUGAL PUMP

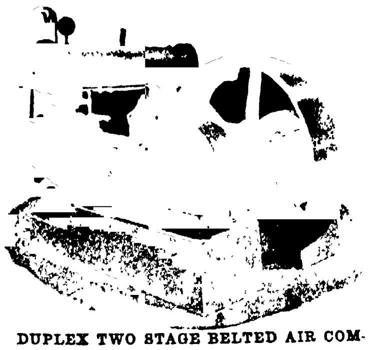


MULTISTAGE CENTRIFUGAL PUMP

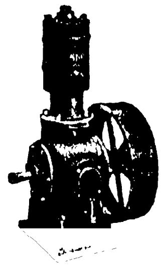


SINGLE SUCTION CENTRIFUGAL PUMP

DUPLEX CROSS COMPOUND TWO STAGE AIR COMPRESSOR

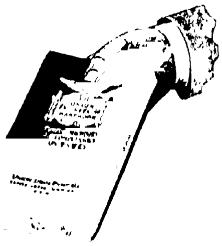


DUPLEX TWO STAGE BELTED AIR COMPRESSOR



SINGLE VERTICAL AIR COMPRESSOR

DUPLEX VERTICAL AIR COMPRESSOR



UNION ENGINEERING HAND BOOK

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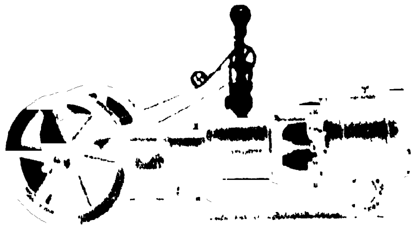
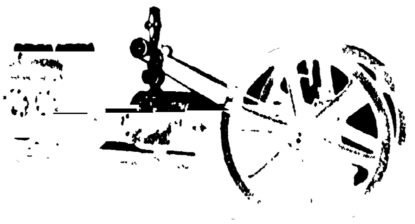
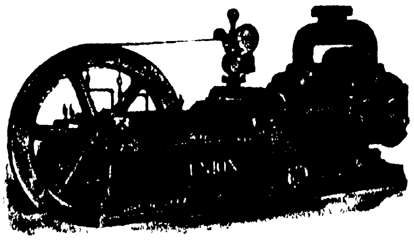


STEAM DRIVEN DRY VACUUM PUMP

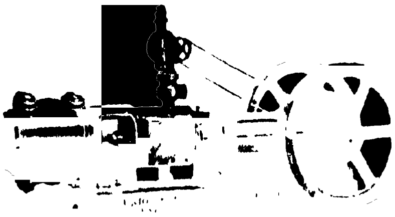
DUPLEX STEAM DRIVEN DRY VACUUM PUMP



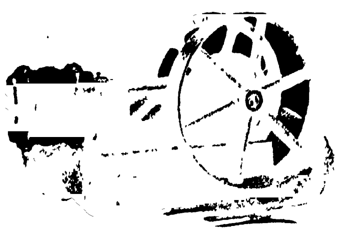
CRANK AND FLYWHEEL WET VACUUM PUMP



DUPLEX CRANK AND FLYWHEEL WET VACUUM PUMP



STEAM DRIVEN AIR COMPRESSOR



BELT DRIVEN AIR COMPRESSOR

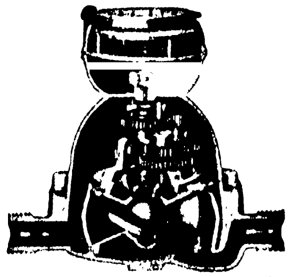
UNION WATER METER COMPANY

Incorporated 1868

MAIN OFFICE AND FACTORY
WORCESTER, MASS.

PRODUCTS

Meters, Cold Water, Hot Water, Oil, Gasoline, other fluids; Union Fitts Chronometer Valves; Union Press for lining Service Pipe with cement; Union Pressure Regulators, no springs; Worcester Steam Fire Signals.



KING MODEL B DISC METER

KING MODEL B DISC METERS

These meters are of the positive measuring self draining type unsurpassed for strength, simplicity, durability and accuracy under varying conditions.

COLD WATER METERS

Outer casings and interior framework bronze

Disc hard rubber, 3 part type reenforced with steel.

Intermediate gears hard rubber or bronze

Pinions and screws genuine monel metal to naval specification

Register round or straight, reading type indicating cubic feet, gallons, liters or unit desired.

Catalog C No. 49.

KING MODEL B METERS FOR HOT WATER

With Union "Cohot" Disc, not metal for accuracy and service.

Intermediate Gears bronze

Other materials and construction like and interchangeable with cold water meters.

Catalog C No. 49.

CORPORATION, CURB AND WASTE STOPS

CURB STOP

U. W. M. Co. Corporations, Curb and Waste Stops are made from new metals and have solid plugs except for the necessary water way. Each stop is tested under 250 lbs. water pressure before shipment and is guaranteed for five years against leakage other than from frost or heat.

FIRE AND FACTORY SIGNALS

Worcester Fire and Factory Signals, tone distinctive and far reaching no confusion with other signals in time of need

Catalog C No. 51.

FIRE AND FACTORY SIGNAL

VERTICAL REGISTER FOR OIL METER

UNION OIL METER

THE UNION OIL METER

For the measurement of oils of different specific gravities under a wide range of conditions and pressures, is of the slow moving, double acting reciprocating piston type, and has given universal satisfaction for many years. This meter has but one valve, conical in form with ports so arranged that opposite ends of the measuring cylinders are filled in such constant succession that uninterrupted flow of liquid is maintained.

The angle of valve to its seat and the rotary motion when operating insures even wear and longer continued accuracy than other types of valves.

Accurate registration and positive action are secured by a simple gear train, no springs or ratchets being used.

The meter may be calibrated for varying service conditions and fine adjustments of registration may be made by change of one gear in the register.

UNION FITTS CHRONOMETER VALVES

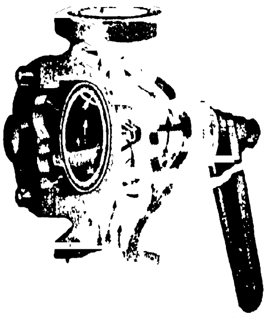
Union Fitts Chronometer Valves are designed for regulating and governing purposes only and should not be used as stop valves.

They are of the rotating valve type, having a conical valve ground to a joint with the seat and ports so arranged that a rotation through an arc of 45 degrees, one-eighth turn, completely opens or closes the valve.

Quickness and ease of operation and sensitive adjustment to varying conditions make these valves especially desirable to control the supply of steam water, gas, oil and air to engines, stokers, tanks, blowers, etc.

Made in standard sizes ranging from ⅜" to 8".

Catalogue C No. 50.



CHRONOMETER VALVES

UNITED LEAD COMPANY

Acid-Proof Lined Pipe, Valves and Special Apparatus

111 BROADWAY, NEW YORK, N. Y.

PRODUCTS

Chemical Lead-Lined

- Pipe
- Tubes
- Fittings
- Coils
- Tanks
- Evaporators
- Condensers
- Soil Pipe
- Valves
- Pipe Bends
- Acid Drums
- Mixing Kettles
- Stills
- Autoclaves
- Special Apparatus

Chemical Lead-Covered

- Pipe
- Tubes
- Copper Sheets
- Agitators
- Steel Sheets
- Steel Bars
- Heating and Cooling Coils

Chemical Lead-Coated

- Pipe
- Tubes
- Sheets
- Bars

Hard Lead

- Acid Pumps
- Plug Bibbs
- Valves
- Special Bends
- Plug Cocks
- Fittings
- Flanged Connections

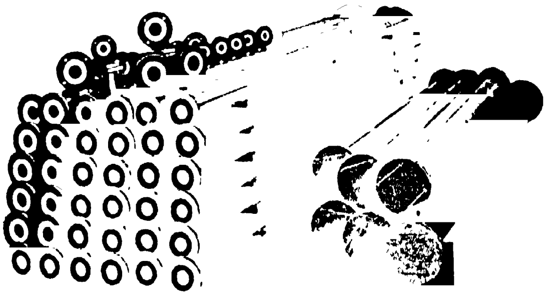
Block Tin

We can furnish any of the foregoing list of products lined, covered or coated with pure Block Tin.

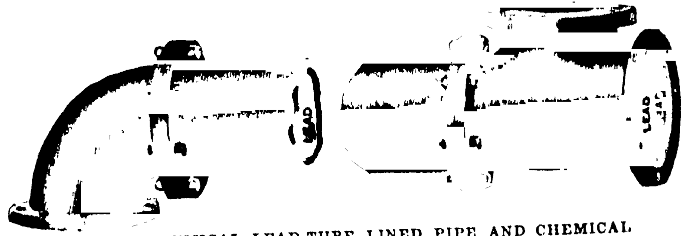
Brass and Copper Lined Pipe

"UNITED" CHEMICAL LEAD-TUBE LINED IRON PIPE

Chemical Lead-tube lined iron pipe, when rightly made, has long been recognized as the ideal combination where strength, acid-resisting and non-corrosive qualities are required. It is particularly serviceable in connection with acids, chemicals, acidiferous mine water, salt water, or any corrosive agents that will affect plain or galvanized iron or steel pipe.



"UNITED" CHEMICAL LEAD-TUBE LINED FLANGED PIPE



"UINTED" CHEMICAL LEAD-TUBE LINED PIPE AND CHEMICAL LEAD LINED FITTINGS

By our special process of manufacture we produce a perfect chemical tube lined pipe with a lining inseparably bonded to the outer tube of iron or steel, affording a smooth interior surface with friction reduced to the minimum and free from porous or defective spots.

"UNITED" FLANGED CHEMICAL TUBE LEAD-LINED IRON PIPE

The acid-proof chemical tube lead lining is protected by the outer iron pipe from pressure, the bond preventing sagging or collapse. The chemical lead lining on flanged pipe is turned over the face of the recessed flange in a most thorough manner, making a perfectly tight lead-to-lead joint at each flange, thus eliminating any danger of leakage.

The distinctive features of this pipe are its strength, acid-resisting and non-corrosive qualities.

Furnished in accordance with engineers' specifications or designs.

"United" flanged chemical lead-tube lined pipe and chemical lead-lined fittings are recommended as of the highest quality, and are used in the largest chemical plants in the world.

"UNITED" CHEMICAL LEAD-LINED FITTINGS

Flanged—All types and sizes of chemical lead-lined flanged fittings can be furnished in any standard dimensions. Regular standard flanges faced and drilled according to the A. S. M. E. standard unless otherwise specified.

Screwed—These fittings are lined by our special process, and are made with a grooved or recessed shoulder joint by which the end of the pipe when made up into the fitting is completely surrounded by the lead, thus preventing corrosion at this point as well as insuring tight joints.

Continued on Next Page

"UNITED" TIN-LINED PIPE AND FITTINGS

The lining in United Tin-Lined Pipe and Fittings is made of best grade tin and inseparably bonded to the iron or steel casing. They are particularly adapted for use in Canning Factories, Food Product Plants, etc., for the conveying of milk, fruit juices, vinegar, and citric acid products. It is also used with great advantage in the conveying of pure water, both spring and distilled.

Many very large plants in the manufacture of these various products are using United Tin-Lined Pipe and fittings.

"United" Tin Covered Pipe and Fittings can also be furnished.

"UNITED" BRASS OR COPPER-LINED IRON PIPE

Particularly adapted for use as range and boiler connections, as well as supply and waste pipes.

The brass or copper tubing is **inseparably united** to the outer tube of iron by the "United" process.

Made with galvanized finish, unless otherwise ordered.

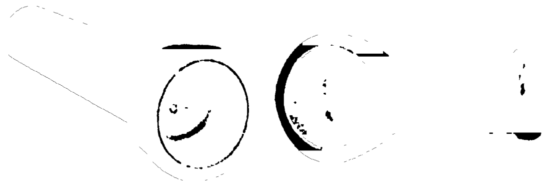
"United" special finish brass fittings are recommended and furnished for use with this pipe.

"UNITED" CHEMICAL LEAD-LINED SOIL PIPE AND FITTINGS

"United" Chemical Lead-Lined Soil Pipe and Fittings are primarily for waste lines where the waste liquor is likely to be acidulous, such as in storage battery plants, laboratories, experimental stations, etc.

There is an increasing demand for this class of pipe among the chemical companies for lines that are to be laid beneath the ground, the outside cast iron shell not being affected by moisture or earth secretions.

"United" Chemical Lead-Lined Soil Pipe and Fittings for this class of work properly installed should last indefinitely. All pipe and fittings furnished by us are of the grade known as "extra-heavy" and the lead lining is of the best grade chemical Lead.



"UNITED" CHEMICAL LEAD-LINED SOIL PIPE AND FITTING

"UNITED" CHEMICAL LEAD-LINED DRAINAGE FITTINGS

For drainage lines we furnish "United" chemical lead-lined Genuine Durham Recessed Fittings. "United" Chemical lead-lined iron pipe and chemical lead-lined Durham Fittings make the most practical drainage lines.

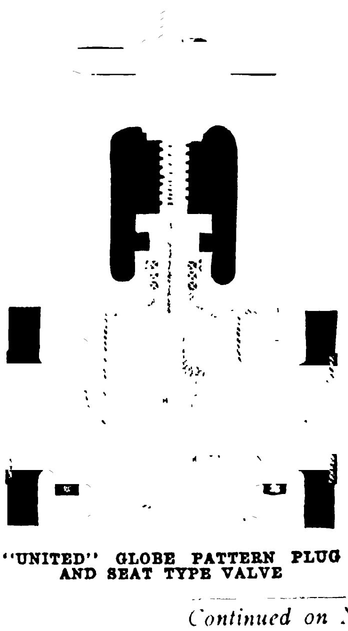
"UNITED" ACID VALVES

"United" Acid Valves are heavily lined throughout with a special acid resisting alloy. Seats are made of a composition which, being harder than lead, is better adapted to withstand the cutting or wear likely to occur at this point.

Constructed of iron and brass, except the interior. They are the strongest acid valves on the market and are not liable to be broken in transportation, during installation, or in actual use, as is the case with valves made wholly of lead composition metal, which is brittle and easily broken, particularly at the flanges. "United" Acid Valve Flanges are made extra strong and will last indefinitely. They have a specially constructed stuffing box packed with an acid-proof packing made to our own formula.

Made in all required sizes and styles: Y, angle, globe, gate, and diaphragm patterns. Particular attention is called to our Taper Plug and Seat Valves as shown in Globe, Y and Angle Pattern. "United" valves are especially adapted for use where there is a possibility of the accumulation of acid settlings or sludge.

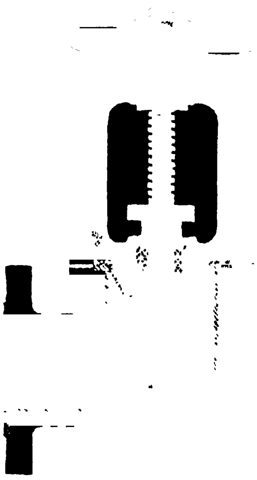
"United" Plug and Seat Type Valves—"United" Valves are stronger and will stand greater pressure than cast iron, cast hard lead or any other type of acid valves. Always tight when closed and by seating at top when opened pressure is taken from the stuffing box insuring a very long life. "United" valves are easily accessible and admit of efficient and rapid repairs, which is very essential where spare valves are not stocked.



"UNITED" GLOBE PATTERN PLUG AND SEAT TYPE VALVE

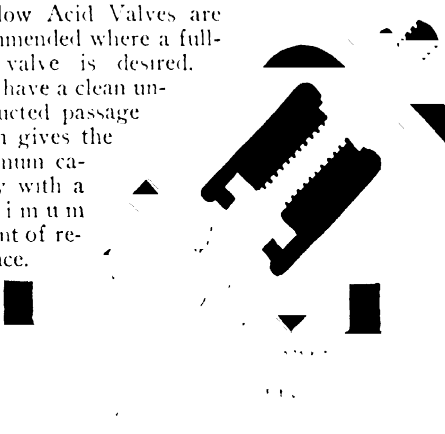
Continued on Next Page

"United" Valves where required can be furnished with acid-proof rubber discs, which are especially adapted for the handling of gritty liquors. These discs are removable and can be replaced at a nominal cost.



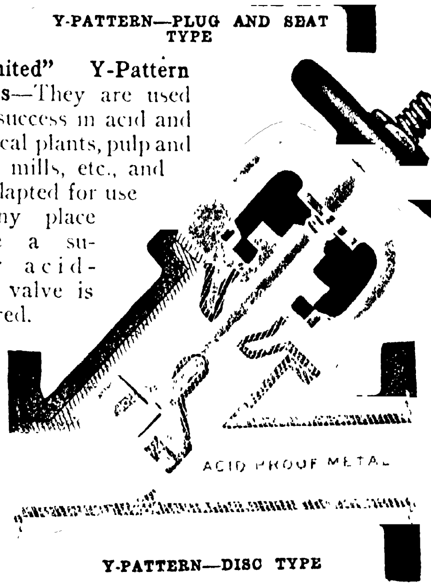
ANGLE PATTERN—PLUG AND SEAT TYPE

"United Y" Pattern or Freeflow Acid Valves are recommended where a full-way valve is desired. They have a clean unobstructed passage which gives the maximum capacity with a minimum amount of resistance.



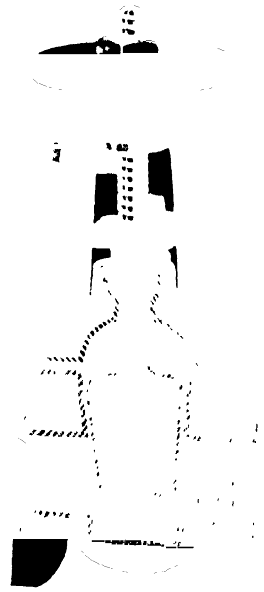
Y-PATTERN—PLUG AND SEAT TYPE

"United" Y-Pattern Valves—They are used with success in acid and chemical plants, pulp and paper mills, etc., and are adapted for use in any place where a superior acid-proof valve is required.



Y-PATTERN—DISC TYPE

We confidently recommend United Acid Valves with the assurance that they will meet in every way the severe tests and conditions encountered where liquids of a searching or corrosive nature are handled.



GATE PATTERN

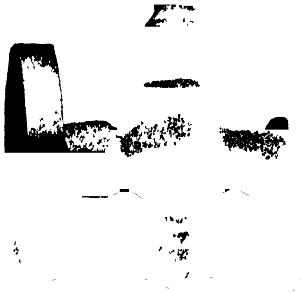
"United" Block Tin Lined Valves—"United" Acid Valves can also be furnished with a heavy lining of pure block tin for the handling of Acetic and Citric Acids, Acid Gases, Food Products, Fruit Juices and distilled or hot water.

Special Acid Valves made and lined in accordance with engineer's specifications or designs.

"UNITED" HARD LEAD PLUG COCKS AND BIBBS

Adapted for contact with acid where they are opened or used **infrequently.** Where the stress caused by operation is sufficiently severe, the installation of "United" acid-proof valves is recommended.

In addition to flanged types illustrated we manufacture Straight Plug Cocks and Plain Plug Bibbs, also special Flanged Hard Lead Taper Shank Cocks with bronze couplings, lead faced.



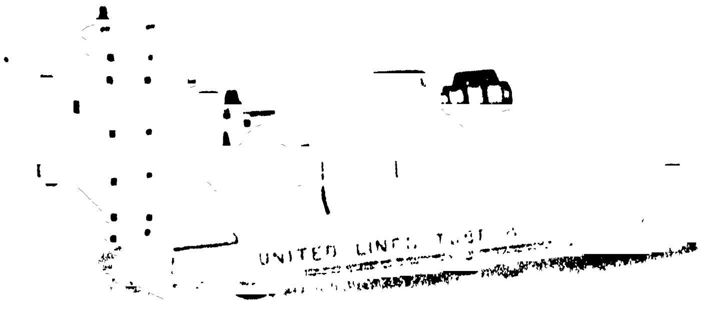
FLANGED PLUG BIBB

FLANGED PLUG COCK

Continued on Next Page

"UNITED" HARD LEAD SINGLE STAGE CENTRIFUGAL ACID PUMPS

We have combined in "United" Hard Lead Acid Pumps all the essential details to make a high-class acid pump



"UNITED" HARD LEAD SINGLE STAGE ACID PUMP
Furnished for Direct or Belt Drive

SIZES AND CAPACITIES OF "UNITED" SINGLE STAGE PUMPS

No	Suction	Discharge	Normal Capacity gallons per minute
1	1½ in	1	30
1½	2 in	1½	75
2	3 in	2	130
3	4 in	3	300
4	5 in	4	500

Data for larger capacities furnished on application

"United" Centrifugal Acid Pumps are designed for, instead of adapted to, the use of the Chemical Industry. They are made for heavy duty and hard service and have proved a most economical and satisfactory installation for loading Acid Barges, and Tank Cars, for Acid Circulating Systems and all General Acid Pumping problems

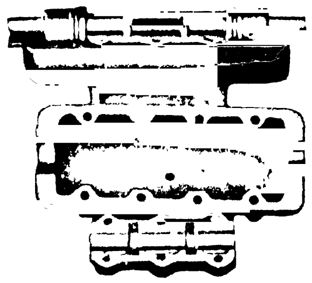
"United" Acid Pumps after careful consideration by competent Engineers were selected for use in places where efficiency was required and repairs were almost impossible.

Casing The casing is made of a special acid resisting hard lead alloy of sufficient thickness to easily withstand the maximum pressure. The inside of the casing is machine finished with impeller fitted accurately, giving a closer running fit.

Shaft and Impeller—The shaft and impeller are made of a special acid resisting alloy and of ample size to transmit the maximum power. The design of the impeller insures the highest possible efficiency.

Stuffing Box—The stuffing box is packed with a special acid resisting packing. It is lubricated by large internal grease glands supplied by acid-proof compression grease cup.

Bearings—Pedestal bearings are generously proportioned and of the self oiling type, with large oil reservoirs all properly housed



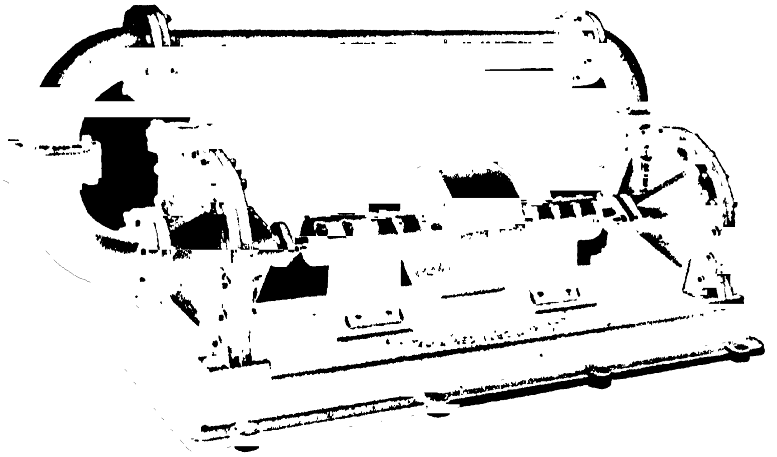
"UNITED" PUMP BEARING

These bearings support the shaft, with the front bearing equipped with self-aligning ball bearing thrusts which keep the impeller properly centered in the shell

"United" Hard Lead Pumps are mounted on a heavy cast iron support, resulting in perfect alignment

"UNITED" TWIN HARD LEAD ACID PUMPS

For installations where the head is greater than can be efficiently handled by a single stage pump.



"UNITED" TWIN HARD LEAD ACID PUMP
Furnished for direct or belt drive

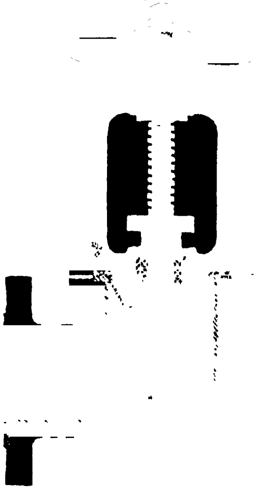
"UNITED" TIN-LINED HARD LEAD CENTRIFUGAL ACID PUMPS

For the handling of Food Products, Vinegar, Acetic Acid, Distilled Water, we manufacture Block Tin Lined Centrifugal Acid Pumps

They embody all the features of the "United" Hard Lead Acid Pumps and are lined with a heavy lining of the best grade of Pure Block Tin by the "United" Process, which insures a perfect Block Tin contact throughout.

Continued on Next Page

"United" Valves where required can be furnished with acid-proof rubber discs, which are especially adapted for the handling of gritty liquors. These discs are removable and can be replaced at a nominal cost.



ANGLE PATTERN—PLUG AND SEAT TYPE

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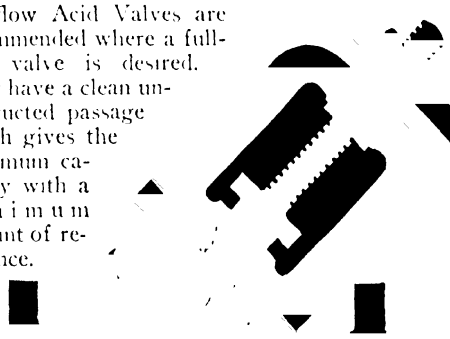

Y-PATTERN—PLUG AND SEAT TYPE

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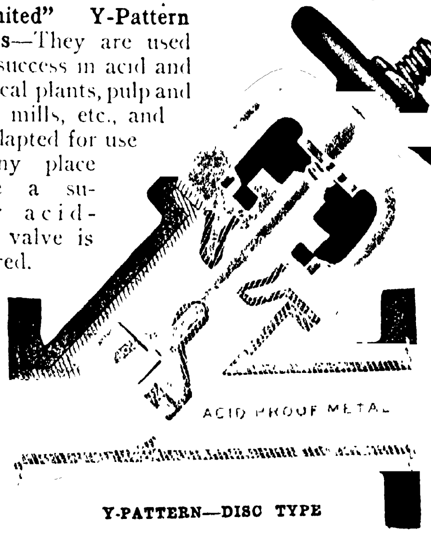

Y-PATTERN—DISC TYPE

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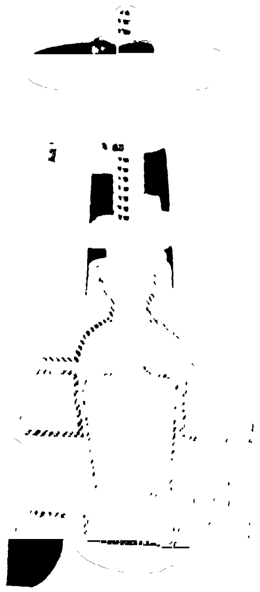


GATE PATTERN

"United" Block Tin Lined Valves—"United" Acid Valves can also be furnished with a heavy lining of pure block tin for the handling of Acetic and Citric Acids, Acid Gases, Food Products, Fruit Juices and distilled or hot water.

Special Acid Valves made and lined in accordance with engineer's specifications or designs.

"UNITED" HARD LEAD PLUG COCKS AND BIBBS

Adapted for contact with acid where they are opened or used **infrequently.** Where the stress caused by operation is sufficiently severe, the installation of "United" acid-proof valves is recommended.

In addition to flanged types illustrated we manufacture Straight Plug Cocks and Plain Plug Bibbs, also special Flanged Hard Lead Taper Shank Cocks with bronze couplings, lead faced.

FLANGED PLUG BIBB

FLANGED PLUG COCK

Continued on Next Page

UNITED STATES CAST IRON PIPE AND FOUNDRY CO.

GENERAL OFFICES: BURLINGTON, NEW JERSEY

SALES OFFICES

Philadelphia, Pa., 1421 Chestnut Street
New York, N. Y. 71 Broadway
Pittsburgh, Pa. Henry W. Oliver Bldg
Chicago, Ill., 122 S. Michigan Blvd
Buffalo, N. Y., 927 E. Ferry Street
Cleveland, Ohio, 1150 E. 26th Street
Birmingham, Ala. American Trust Bldg
St. Louis, Mo., Security Bldg
San Francisco Cal., Monadnock Bldg
Minneapolis, Minn., Plymouth Bldg
Dallas, Texas, Scollard Bldg

WORKS

Addyston, Ohio
Anniston, Ala
Bessemer, Ala
Birmingham Ala
Buffalo N. Y
Burlington, N. J
Chattanooga Tenn
Cleveland Ohio
Columbus, Ohio
Louisville, Ky
Scottdale, Pa

PRODUCTS

"Usicast" Castings to Engineer's Designs, including Chemical, Sugar House and Miscellaneous Castings.

Barometric Condenser furnished complete.

Cast Iron Pipe and Fittings, 2" to 84" in diameter, Bell and Spigot; Flanged; Screw or Plain End; Flexible Joint; Standard or Special.

"USICAST" CHEMICAL CASTINGS

We are prepared to furnish Usicast chemical castings in any size up to 50 tons, for all chemical purposes in accordance with designs or specifications submitted by the customer and are glad to cooperate in the details of design with our customers' Engineering Department if desired.

To meet special conditions of service, or of the chemical process involved, the raw material is selected after careful analysis in our chemical laboratory, and the

DIGESTER

72 inches in diameter, 10 feet high

STANDARD THICKNESS AND WEIGHT OF CAST IRON PIPE

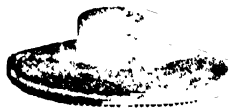
Nominal Inside Diameter, Inches	Class A 100 Foot Head 43 Lbs. Pressure				Class B 200 Foot Head 86 Lbs. Pressure				Class C 300 Foot Head 130 Lbs. Pressure				Class D 400 Foot Head 173 Lbs. Pressure			
	Thickness Inches	Pounds Weight Per Foot	Bell	Single Flange	Thickness Inches	Pounds Weight Per Foot	Bell	Single Flange	Thickness Inches	Pounds Weight Per Foot	Bell	Single Flange	Thickness Inches	Pounds Weight Per Foot	Bell	Single Flange
3	.39	13.0	18.8	6.4	.42	14.6	19.3	6.2	.45	15.5	19.3	6.2	.48	16.4	19.3	6.2
4	.42	18.0	20.4	11.[illegible]	.45	20.1	22.9	10.7	.48	21.3	22.9	10.7	.52	22.8	22.9	10.7
6	.44	27.9	28.9	15.0	.48	31.1	32.9	14.4	.51	32.9	32.9	14.4	.55	35.3	32.9	14.4
8	.46	38.7	43.5	23.1	.51	42.7	43.5	23.1	.56	48.0	51.6	22.0	.60	51.2	51.6	22.0
10	.50	51.9	57.9	32.2	.57	58.8	57.9	32.2	.62	65.5	65.4	30.6	.68	71.4	65.4	30.6
12	.54	67.0	70.9	47.7	.62	76.4	70.9	47.7	.68	85.4	85.1	45.6	.75	93.7	85.1	45.6
14	.57	82.3	87.8	58.1	.66	94.7	87.8	58.1	.74	108.1	95.8	55.1	.82	119.2	95.8	55.1
16	.60	98.8	111.1	73.2	.70	114.6	111.1	73.2	.80	133.3	128.1	69.1	.89	147.5	128.1	69.1
18	.64	118.3	134.5	78.1	.75	137.8	134.5	78.1	.87	162.4	152.5	72.8	.96	178.4	152.5	72.8
20	.67	137.4	158.2	99.8	.80	163.1	158.2	99.8	.92	190.6	189.2	92.9	1.03	212.3	189.2	92.9
24	.76	187	202	137	.89	217	202	137	1.04	258	253	127	1.16	286	253	127
30	.88	266	296	214	1.03	313	298	207	1.20	367	351	196	1.37	421	413	186
36	.99	359	383	327	1.15	419	441	315	1.36	498	511	300	1.58	582	584	283
42	1.10	465	537	459	1.28	542	584	444	1.54	657	696	415	1.78	764	796	392
48	1.26	608	663	556	1.42	687	748	539	1.71	833	899	504	1.96	961	1034	471
54	1.35	732	847	722	1.55	844	989	691	1.90	1041	1181	642	2.23	1228	1382	600
60	1.39	837	1007	884	1.67	1010	1141	836	2.00	1219	1390	770	2.38	1457	1647	719
72	1.62	1171	1346	1291	1.95	1415	1588	1219	2.39	1745	1936	1123	2.82	2071	2302	1028
84	1.72	1447	1776	1810	2.22	1878	2218	1670	2.74	2332	2688	1524	3.24	2774	3249	1381

Standard length 12 feet
Weights per foot listed above are for the barrel and do not include any allowance for bell.

melting of the iron is carried on under the direct supervision of our metallurgist to insure the best mixture for the casting.

The illustrations shown represent the size and variety of castings we have made and supplied to various satisfied customers for a number of years. We make castings of intricate design requiring skilled workmanship and high grade machining. All blueprints are held in strict confidence and specifications are carefully adhered to.

CRYSTALLIZING PAN



MUSHROOM PLATE

EVAPORATOR SECTIONS COMPLETE

"USICAST" SUGAR HOUSE CASTINGS

Our shops are well equipped for manufacturing large evaporators, vacuum pans, and filters required for sugar house work. Much of the sugar material is for export and our plants are admirably located to handle such shipments.

TRIPLE EFFECT EVAPORATORS

BAROMETRIC CONDENSERS

The patented features of our Barometric Condenser make it especially adaptable to evaporation processes where the absolute pressure in the evaporating chamber should be constant and where the degree of vacuum should be maximum for the amount of cooling water consumed.

SO_2 GAS COOLERS

CHEMICAL PIPING

Cast Iron Pipe is used successfully in the chemical industry for the conveying of gases, acids and other corrosive chemical solutions.

It is especially adaptable to sulphuric acid installations, being used for carrying both the hot and cold SO_2 gas and acid.

On account of its heat resisting properties it is also widely used in high temperature processes. It is used successfully at temperatures between 1200° and 1400° F. and in cases where the temperature does not vary appreciably it has been used with success as high as 1800° F.

In sugar house work **U. S. Cast Iron Pipe** is useful not only in conveying the various solutions but also to handle the steam and water supply.

CAST IRON PIPE IN A SULPHUR BURNER INSTALLATION

UNITED STATES RUBBER COMPANY

1790 BROADWAY, NEW YORK, N. Y.

Cable Address "USRUBCO" New York

BRANCHES IN EVERY INDUSTRIAL CENTER

PRODUCTS

Transmission, Conveyor and Elevator Belting
Packings and Pump Valves
Acid Hose
Hard Rubber Goods—Tanks, Dippers, Pitchers, Buckets, Dye Sticks, Pipe and Fittings, Sheet, Rod, Tubing, Molded and Turned Articles.

We also manufacture air hose, water hose, steam hose, fire hose, and hose for every other purpose, acid gloves, special rubber boots, friction tape and splicing compound, plumbers' specialties, rubber tiling, mats and matting and a large variety of miscellaneous molded rubber specialties.

SERVICE

In every industrial center you will find a United States Rubber Company branch ready to serve you

TRANSMISSION BELTING

Power economy is gained only by transmission efficiency. The highest belting efficiency is reached with a Rainbow Friction Surface Belt, if properly installed.

Rainbow Belting is a properly balanced combination of duck and rubber, designed for severe transmission service.

Rainbow is uniform in construction and possesses high tensile strength with minimum stretch. It runs true, grips the pulley and delivers full power.

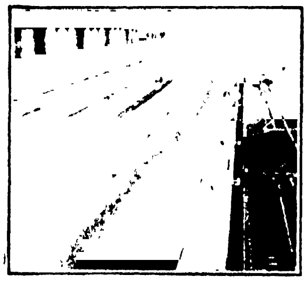
Our belting men will be glad to inspect the transmission conditions of your plant and make a belting recommendation.

For high speed over small pulleys we recommend our Pilot Belt.

RAINBOW BELT ON BEATER DRIVE IN PAPER MILL

CONVEYOR AND ELEVATOR BELTS

The greatest step toward increasing the efficiency of conveyor and elevator belts is our new method of constructing every U. S. Belt for the particular service it is to perform.



U S COAL CONVEYOR BELT IN MUNICIPAL POWER PLANT

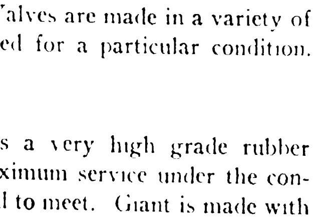
The operating speed of every conveyor belt, the character of material to be handled, the angle at which the belt operates, the arrangement and number of idlers, the direction of the load and the position of the drive—all are taken into account by our engineers. They will be glad to cooperate with you in specifying the right belt for every service.

PACKINGS AND PUMP VALVES

United States Rubber Company Packings have been thoroughly tested under practically every mechanical condition. All have proven their merit but certain styles or brands are recommended as being particularly good for certain conditions. There is a tested type of United States Packing to meet practically every mechanical need.

Our engineers are at your service to aid you in determining the most suitable style or brand to meet each of your requirements.

Simplify your packing problems by specifying United States Packings.



PEERLESS PISTON PACKING

Usco Rubber Pump Valves are made in a variety of compounds, each adapted for a particular condition.

ACID HOSE

Giant Acid Hose has a very high grade rubber lining made to give maximum service under the conditions that it is required to meet. Giant is made with various thicknesses of tube to resist the action of various acids and dyestuffs. Its construction is determined in every instance by the kind, strength, and temperature of the acid or liquid to be conducted.

GIANT ACID HOSE

Continued on Next Page

HARD RUBBER PRODUCTS

Hard rubber, being one of the best known acid resisting substances, has contributed very materially to the wonderful progress made by chemists. Hard rubber valves and fittings are being used more and more to handle hydrochloric acid and other chloride liquids which attack all the ordinary materials of construction. The United States Rubber Company manufactures a large variety of hard rubber products and is prepared to manufacture special apparatus according to customers' specifications.

TANKS

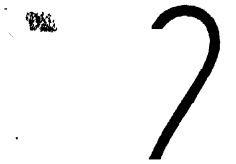
Hard rubber tanks can be made in many sizes and designs. We also line steel tanks with hard rubber.

HARD RUBBER DIPPERS

DIPPER

Hard rubber dippers are found very serviceable for dipping acids and chemicals. Our standard dipper is of two quart capacity but we can also manufacture dippers of any size desired.

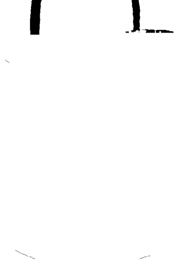
HARD RUBBER PITCHERS



PITCHER

We manufacture a standard three quart pitcher but also make pitchers of larger capacity. Chemists find them very useful in their work.

HARD RUBBER BUCKETS



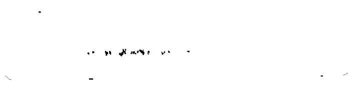
BUCKET

Our buckets for handling acids and other chemicals are tapered and come with or without the spout, as specified. They are heavily reenforced at the top and are equipped with a very strong hard rubber handle which has a steel core. The standard sizes are as follows, but special sizes can also be furnished:

2 Gallon ¼" Wall 7 x 8 x 11 O. D.
3 " ¼" " 8 x 9½ x 12 O. D.
4 " ⅜" " 9 x 10½ x 13 O. D.

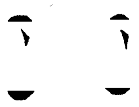
HARD RUBBER DYE STICKS

Our patented hard rubber dye stick is a great improvement over the old wooden stick. It is made of a wooden rod on which hard rubber is vulcanized. It is strong, yet light, and the semi-soft rubber bumpers on the ends prevent breaking and chipping when the stick is dropped on the floor. The standard size is 12 inches long, one inch inside diameter and 1⅛ inches outside diameter. Other sizes furnished if desired.



DYE STICK
One End Cut Away to Show Wooden Core

PIPE AND FITTINGS



COCK

Hard rubber pipe is usually furnished in 8 foot lengths but can be made in any length up to 10 feet. All hard rubber pipe lines should be supported. A plain wooden support is recommended. Our pipe fittings, which include unions, tees, couplings, elbows, and cocks, are made very strong and are threaded to fit pipe.

ELBOW

APPROXIMATE SIZES OF HARD RUBBER PIPE

Pipe	Inside Diameter	Outside Diameter
⅜"	⅜"	¾"
½"	½"	15/16"
¾"	¾"	1 ⅛"
1"	1"	1 ⅜"
1¼"	1¼"	1 11/16"
1½"	1½"	2 1/16"
2"	1⅞"	2 ⅜"
2½"	2¼"	2 ¾"
3"	2¾"	3 ½"

The inside diameter of hard rubber pipe usually runs a trifle under the dimensions specified, the same as in iron pipe. This is in order that the wall will be heavy enough to sustain threading of the iron pipe size threads.

SHEET, ROD AND TUBING

Chemists frequently require pieces of hard rubber sheet, rods and tubing cut into certain sizes to meet special conditions. We are in a position to furnish this promptly and to almost any specifications.

MOLDED AND TURNED ARTICLES

Many special articles can be molded and machined from hard rubber to meet special conditions in chemical plants.

THE UNITED STATES AND CUBAN ALLIED WORKS ENGINEERING CORPORATION

OWNING AND OPERATING

Krajewski-Pesant Corporation   Bradford Works   Havana Dry Dock Company   Havana Iron Works

WORKS

Bradford, Pa., and Havana, Cuba

NEW YORK OFFICES

165 Broadway

Cables "IDOLWAX," New York and Havana

PRODUCTS

Evaporators and Vacuum Pans for Concentration of any Liquid.

Centrifugals for all requirements of the chemical, sugar and other industries.

Krajewski Sugar Cane Crushers and Mills.

Sugar Machinery; Complete Sugar Factory Equipment.

Air Compressors, Centrifugal Pumps, Filters, Vacuum Pumps.

Tanks, Towers and Steel Plate Work of all kinds.

Industrial Chemical Plants, Sugar Factories and Steel Construction erected in any part of the world.

ENGINEERING AND CONTRACTING

This corporation, having the services of an able engineering corps, will be pleased to take up problems of reconstruction and new building wherever they may arise. Our special engineering field lies in sanitation, water supply, sewerage, erection of piers, warehouses, terminals, and all steel frame and concrete construction.

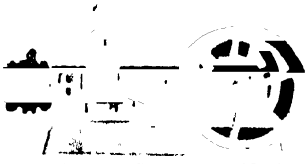
KRAJEWSKI SUGAR MACHINERY

Krajewski is one of the best known names in the sugar machinery world. The firm has been in active and continuous existence since 1861.

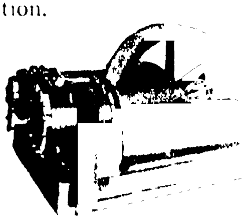
KRAJEWSKI ELECTRIFIED MILLING PLANT FOR CANE SUGAR CENTRALS

"UNITED" AIR COMPRESSORS

All **"United"** air compressors are constructed with entirely enclosed dustproof type of frame. Moving parts are flooded continuously with oil and lubrication starts and stops without attention.



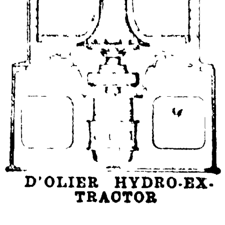
CLASS DN—SINGLE STAGE STEAM-DRIVEN COMPRESSOR



CLASS CN—TWO-STAGE POWER-DRIVEN COMPRESSOR

D'OLIER ELECTRICALLY DRIVEN HYDRO-EXTRACTORS

These machines represent high engineering skill and the best mechanical construction. The center of gravity is low with less possibility of vibration. There is unobstructed access to basket.



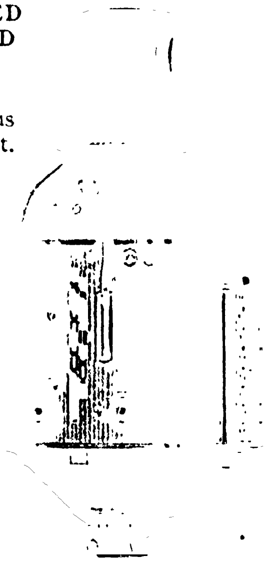
D'OLIER HYDRO-EXTRACTOR

KRAJEWSKI IMPROVED COIL VACUUM PAN AND MULTIPLE EFFECT EVAPORATORS

This pan is built in various sizes from 5 ft. up to 14 ft. diameter as required.

There is an excellent circulation of the massecuite. The sectional coils insure quick drainage. There is an efficient separator on the vapor outlet. The pan has a large discharge opening.

We also build vacuum pans with calandrias and coils, and triple and quadruple effects ranging in size from 1500 sq. ft. to 26,000 sq. ft. of heating surface.



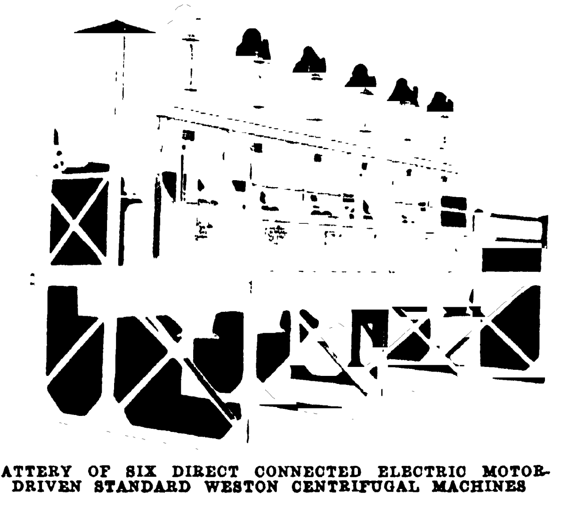
KRAJEWSKI COIL VACUUM PAN

STANDARD WESTON CENTRIFUGALS

Every improved feature is embodied in the design and construction of our Standard Weston Centrifugals. All parts of these Machines are manufactured in our own works.

They are made with belt, water or motor drive. Motor driven units are equipped with standard motors having a simple and effective control. In the belt-driven units, pulley and brake are made in one piece and so designed as to insure thorough self-cooling, thus prolonging the life of the belt.

All the rotating elements are easily accessible.



BATTERY OF SIX DIRECT CONNECTED ELECTRIC MOTOR-DRIVEN STANDARD WESTON CENTRIFUGAL MACHINES

VALLEZ ROTARY FILTER PRESS

The Vallez Rotary Filter Press
205 Mountain Street
BAY CITY, MICH.

PRODUCT

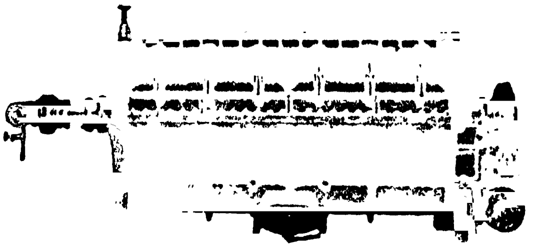
Vallez Rotary Filter Press

CONSTRUCTION

This filter press is made of a cast iron cylinder, divided on the horizontal center line into two halves

The top half is provided with inspection doors on the side, and a series of sprays located on the top These sprays are connected to a header which is connected with water or compressed air

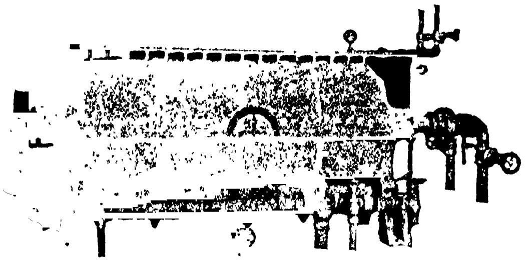
The lower half has a trough on the bottom. In this trough a right and left screw is provided to remove the cakes through a door situated in the middle and at the bottom. The right and left screw is provided with gears for driving it.



EXTERIOR FRONT VIEW VALLEZ ROTARY FILTER PRESS
Note inspection doors

The filtering element is composed of a series of frames mounted on a hollow shaft. These frames are spaced 2½", 3" or 6" apart, according to the material to be filtered. The hollow shaft is connected on one end with two or three outlet pipes. The frames are made of two perforated plates, with a coarse screen between to keep them apart and are provided with proper opening to connect the inside of the frames with the hollow shaft. Cotton cloth or metallic cloth is used, according to material to be filtered.

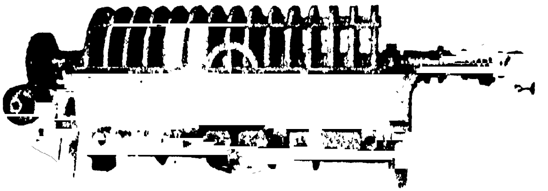
The bottom of the press is provided with a header, connecting at four places at the bottom of the filter. In this header are the proper inlet and outlet valves.



EXTERIOR REAR VIEW VALLEZ ROTARY FILTER PRESS
Note header

OPERATION

The filter being closed, the juice is admitted at the bottom and fills the press, the air being let out by a small valve on top of the filter. The liquid filters through the frames and then goes out through the hollow shaft. The cakes form on the frames. To know when the press is full, a small paddle, situated between two of the frames, rests on the surface of one frame, and as the cake gets thicker the paddle raises from the frame and moves an indicating needle outside, showing the thickness of the cake all of the time. When the press is full, the excess liquid is evacuated by using compressed air, and water is introduced to wash the cake. After the cake is washed, the excess water is removed by compressed air. The center door is then opened, the screw started and the cakes loosened by the spray pipes, using water at 60 pounds pressure, if cakes do not need to be removed dry. If cakes have to be removed dry, compressed air at 150 pounds pressure is used instead of water. When the filter is to be used to filter syrup where the sediment is very small, the frames are coated with Kieselgur, and the liquid is filtered through this film of Kieselgur. During the filtration the frames revolve at the rate of 1½ r. p. m



INTERIOR REAR VIEW VALLEZ ROTARY FILTER PRESS
Note filtering element

ADVANTAGES

The advantages of the Vallez Filter are many.

The main one is labor saving.

Less water to wash the cakes (and they are perfect in thickness).

Saving of cloths, as the cloths are washed in the filter without removal.

Perfect filtration. Every drop of filtered liquid is as clear as crystal.

Least cost of maintenance.

Perfect filter to insulate, if needed.

Very clean installation.

The Vallez Filter can be used for almost any filtration of different manufactures, and makes a splendid filter for syrups, such as sugar factory syrup, malt syrup, etc.

Before deciding on your filtration requirement, refer to us for information.

This filter is made in different sizes:

A laboratory size 16" in diameter by 30" long.

The largest size 45" in diameter by 10' long.

E. B. VAN ATTA & CO., INC.

Manufacturers of Hydraulic Presses, Pumps, Accumulators and Other Hydraulic Appliances

MAIN OFFICE AND FACTORY
OLEAN, N. Y.
BRANCH OFFICE, 50 Church St., NEW YORK, N. Y.

PRODUCTS

Hydraulic Presses, Pumps, Valves, Accumulators, and Intensifiers.

GLUING PRESSES

Cold Process Veneer
Waterproof Veneer—hot process

VULCANIZING PRESSES

Rubber
Hard Fibre

FRUIT PRESSES

Cider
Grape
And other fruit juices

BALING PRESSES

Cloth
Paper
Metal Scrap

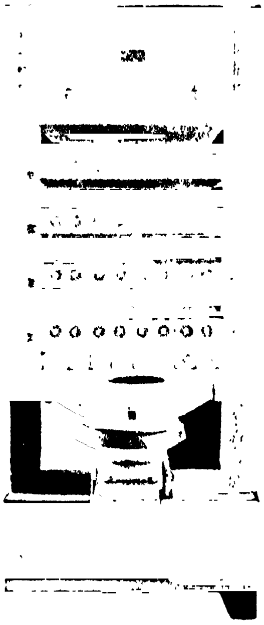
EXTRACTING PRESSES

Asbestos Board
Wood Pulp
Paper Pulp
Tankage
Garbage
Grease
Scrap
Leather
Oil

STEEL STEAM PLATES

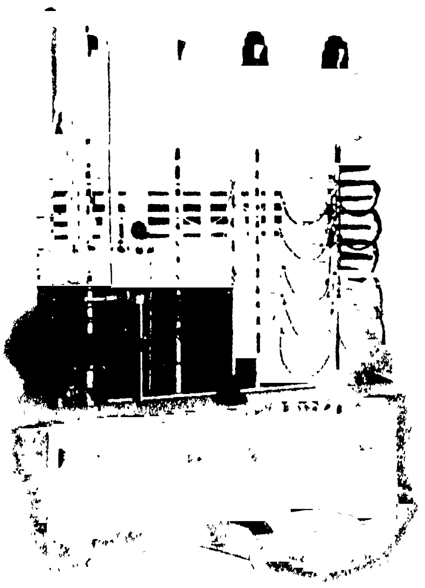
SPECIAL PURPOSES

We are prepared to design and build hydraulic presses of any size and tonnage for any purpose for which it is practical to use hydraulic pressure.



HOT PLATE PRESS

Four Openings for Rubber Vulcanizing and Heating Other Materials under Pressure



HOT PLATE PRESS

Ten Openings for Waterproof Glue Veneer, and other Processes requiring heat under pressure

VENDOME COPPER AND BRASS WORKS

Coppersmith, Boiler and Tank Works

721-723-725-727 E. MAIN ST., LOUISVILLE, KENTUCKY

PRODUCTS

Chemical Equipment of Copper and Brass, Boiler and Tank Work; such as Distilling, Rectifying, Extracting, Dissolving, Evaporating, Heating and Cooling Apparatus.

Stills, Kettles, Columns, Autoclaves, Tanks and Piping of Copper and Brass.

Sheet Copper: Seamless Copper and Brass Tubes.

FACILITIES

We have had a long and successful experience in building equipment of the above classes. Our shop is equipped to handle any construction of this kind. Our workmen are skilful and careful. We carry at all times a large stock of sheet copper and copper and brass tubing, and can execute orders placed with us promptly.

SERVICE

We can cooperate with chemists and engineers who are building, altering or designing plants in which copper or brass equipment or boiler and tank work is needed.

Repair work and reconstruction will have our careful attention at all times.

Submit us your designs and allow us to estimate on them. You will find our prices altogether reasonable and our service prompt, intelligent and courteous.

Sometimes we may be able to suggest changes in designs that will enable them to be executed more economically. Our long experience with copper distillation equipment enables us to do this.

COMPLETE DISTILLERY

Established 1867

THE VILTER MANUFACTURING COMPANY

891-897 Clinton Street

MILWAUKEE, WISCONSIN

BRANCH OFFICES

220 Broadway,
New York, N Y
10th and Chestnut Sts,
Philadelphia, Pa

324 Finance Bldg,
Kansas City Mo
731 Monadnock Block,
Chicago, Ill

2723 Bennett Court,
St Louis, Mo
707 Globe Bldg,
Minneapolis, Minn

2650 Santa Fe Ave
Los Angeles, Cal
28 West Broadway
Salt Lake City Utah

419 Commercial Bank Bldg
Houston Texas
106 West Roy St
Seattle, Wash

314 Curry Building,
Pittsburgh Pa
Wellington
New Zealand

PRODUCTS: Vilter Ice Making and Refrigerating Machinery, Ammonia Valve and Fittings, Ammonia Condensers, Brine Coolers, Vilter Corliss Engines, Vilter Poppet Valve Engines, Special Machinery, Oil Coolers.

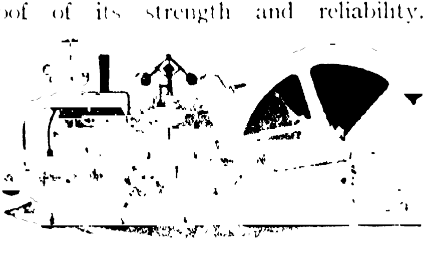
VILTER HORIZONTAL HIGH SPEED AMMONIA COMPRESSOR:

All accepted principles of refrigerating machinery construction, and all subsequent, consistent developments and improvements find embodiment in Vilter Horizontal High Speed Ammonia Compressors. They are specially designed for direct connection to the newest types of high speed prime movers, and particularly adapted for direct connection to synchronous motors, a method of drive which is proving so highly economical and efficient.

Vilter High Speed Ammonia Compressor

VILTER ROLLING MILL TYPE COMPRESSOR:

The rolling mill frame machine is built along very heavy lines for all conditions of service. It is used with only slight modifications in all sizes of compressors. Its very appearance gives assurance and proof of its strength and reliability. All parts of the base rest upon the foundation, thus giving a uniform distribution of the load and insuring maximum stability and rigidity.



Vilter Ammonia Compressor, Direct Connected Corliss Engine

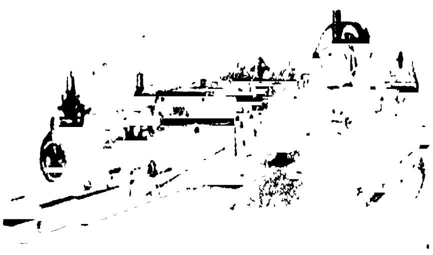
VILTER CORLISS ENGINE:

The Rolling Mill frame Corliss engine is of exceptionally massive construction and adapted for any class of service, from the steady belted load to direct connected electric service, in which the engine is subjected to heavy and extremely variable loads. Built for high steam pressures and high rotative speeds. The valve gear is of high speed type, and all valves are double ported Built in many sizes, either simple, tandem compound or cross compound.

The Girder frame Corliss engine is strong and rigid and designed to take shocks and overloads without possibility of misalignment. Made in sizes from 25 H.P. up.

VILTER POPPET VALVE ENGINE:

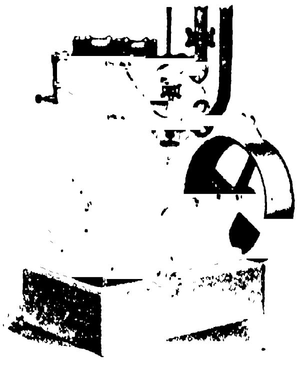
The Poppet Valve engine operates with high steam pressure and superheat, and is remarkable for its low steam consumption and in the reduction of the number of its working parts to about 60% of the number used in other designs.



Simple Compressor, Direct Connected to Tandem Compound Engine with High Pressure Poppet Valve Cylinder and Low Pressure Corliss Cylinder

VILTER VERTICAL SINGLE ACTING TWIN CYLINDER AMMONIA COMPRESSOR:

A vertical single acting compressor specially designed for users of comparatively small quantities of refrigeration. Built in sizes from 1 ton to 20 tons capacity per 24 hours.



Vilter Twin Cylinder Ammonia Compressor, Small Capacity

VILTER LOW TEMPERATURE COMPRESSION SYSTEM:

A system manufactured under D L Davis patents whereby extremely low temperatures are efficiently and economically produced with compression refrigerating machinery. The simple ammonia compression machine has been conceded as both expensive and uneconomical for low temperature work These detrimental features are overcome by the Low Temperature Compression System by the following methods:

(1) Multistage compression, which increases volumetric efficiency and reduces the power required for operating the compressors.

(2) Cooling the liquid before entering the low temperature refrigerator, thus reducing amount of gas handled by low pressure compressor and power per ton of refrigeration—because the work of cooling is handled by the high pressure cylinder.

(3) Proper traps, etc

Bulletins, catalogs and full data regarding our products will be mailed on request.

THE VITREOUS ENAMELING COMPANY

FACTORY AND GENERAL OFFICES

CLEVELAND, OHIO

PRODUCTS

Pans for Vacuum, Shelf or Tunnel Dryers, Vitreous Enameled Steel Evaporating Pans, Pigment Drying Trays, Commercial Photograph Developing Trays, etc., Non-Corroding Chemical Resisting Trays or Pans for Dyestuff and Paint Manufacturers, Manufacturing Chemists and Allied industries.

FINISH

Vitreous Pans and Trays Enameled Dark Blue.

In 1917, recognizing the need of an evaporating pan or drying tray that would resist chemical action and at the same time stand more than the ordinary amount of rough handling, we brought out the **Vitreous** Enameled Pans and Trays. That they filled a long felt want is attested to from the fact that hundreds of Chemical Plants, Paint Manufacturers, Laboratories and Manufacturing Chemists, here and abroad, are now using our product to the exclusion of all other kinds. **Vitreous** Pans and Perforated Trays (Patented) are no longer an experiment, but an actual necessity in plants where shelf, vacuum or tunnel dryers are in operation.

Aside from the tremendous saving in equipment, the use of **Vitreous** Pans means

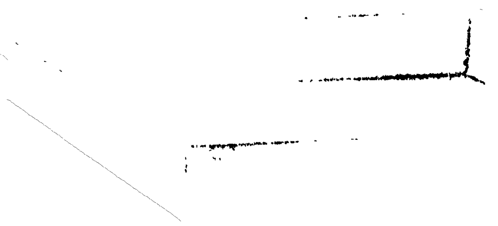
Reduced manufacturing costs
Cleaner material
Absence of corrosion
Ease of cleansing
Freedom from adhesion
(and where wooden trays are used)
Lessened fire risk

Let us send you a sample for trial.

EVAPORATING PANS

Reenforced welded corners, an exceptionally strong and durable pan.

Manufactured to order in any size.

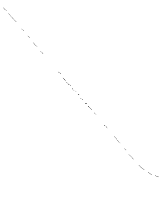


EVAPORATING PAN

PIGMENT DRYING TRAYS

Made with curled edge on all sides to facilitate easy and quick handling. Especially recommended for pigment drying and other compressed products where flat drying surface is desired.

Manufactured to order in any size, plain or perforated. (Patented.)



PIGMENT DRYING TRAY

LIPPED DEVELOPING PANS

Made with flaring sides, heavy curled edges and lip. Admirably suited for Pharmaceutical work, Photographic developing, etc. Furnished in any size required.

LIPPED DEVELOPING PAN

HENRY VOGT MACHINE COMPANY

Oil Refinery Equipment: Water Tube and Horizontal Return Tubular Boilers: Refrigerating Machinery: Drop Forged Steel Valves and Fittings

LOUISVILLE, KENTUCKY

BRANCH OFFICES New York N. Y. Chicago Ill. Tulsa Okla.

Vogt

PRODUCTS

Oil Refinery Equipment—Paraffine Wax Presses—Distillate Wax Chilling Machines for cold test oils, Steam and Crude Stills, Auto Truck Tanks, Agitators, Condenser Boxes and welded vessels. Water Tube and Horizontal Return Tubular Boilers—Sectional Steel Casings—Sectional Shaking and Dumping Grates—Steel Stacks and Tanks—Refrigerating Machinery—Exhaust Steam Ammonia Generators, Aqua Ammonia Pumps and Drop Forged Steel Valves and Fittings.

REFRIGERATION

Forty years of effort in the design and construction of the Vogt Absorption Machine has brought forth the present economical and efficient exhaust steam unit. By an exhaust steam unit is meant a refrigerating machine capable of developing its rated capacity through the use of steam that has already performed useful work.

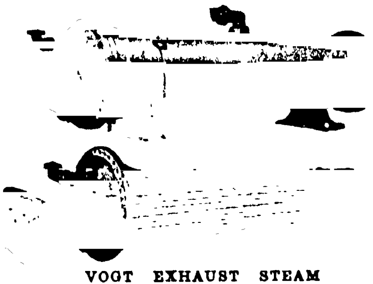
100 TON VOGT EXHAUST STEAM REFRIGERATING MACHINE

A further economy is effected by combining the exhaust steam refrigerating machine with any mill, light or power plant, the refrigeration or ice so produced being virtually a by-product. When it is understood that the operation of such a machine is possible without the introduction of any complicated parts, our correctness of design is thoroughly established.

The workmanship and material used on our machines are of the very best, our Drop Forged Valves and Fittings being one of the superior features.

VOGT EXHAUST STEAM AMMONIA GENERATOR (Patented)

Designed to operate on the lowest possible steam pressure. The shell and heads are made of semi-steel, this metal being the most durable in contact with hot ammonia.



VOGT EXHAUST STEAM AMMONIA GENERATOR

The coil is made of straight extra heavy wrought iron pipe, and each pipe is closed at one end. The steam is delivered through an inside pipe at the closed end and travels only one time the length of the generator. This eliminates the friction and enables operation at minimum pressure.

Other special features are: no return bends, no bent pipes, no exposed heating surface, no stuffing boxes on steam coils; no threaded joints inside of shell.

VOGT AQUA AMMONIA PUMP

The Vogt aqua ammonia pump is designed to handle strong aqua ammonia.

The steam cylinder is equipped with balanced piston type valve, governed by an auxiliary valve that is mechanically operated. The steam consumption is considerably low for this type pump, and the speed is automatically controlled at any desired number of strokes by means of a mason regulator. The ammonia cylinder is provided with an extra long stuffing box and water chamber. The ammonia piston rod is made of special steel and connected with coupling to the steam piston rod so it can be easily removed when necessary. The pump is mounted on a heavy base.

VOGT AQUA AMMONIA PUMP

VOGT DROP FORGED STEEL VALVES AND FITTINGS

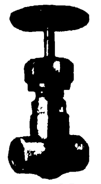
These valves and fittings embody every feature and improvement that assures efficient and enduring service. They fulfil the most exacting requirements of high pressures and temperatures of oil, gas, ammonia, air, water, steam and superheated steam.

Vogt Fittings are absolutely guaranteed not to leak when properly installed. They are scientifically forged from open hearth steel of high tensile strength, which makes them proof against shrinkage cracks, blow or air holes and other defects and flaws commonly inherent in all gray iron, malleable, cast steel, and other cast fittings.

MONEL METAL VALVE

TEE

ELL



VALVE

THE VOGT MONEL METAL VALVE

The stem, disc, and seat of this Valve are Monel Metal. The heat and acid resisting qualities of the Monel Metal parts, together with a Drop Forged Body, Packing Nut and Bonnet, all high grade steel, make it a superior Valve for work in acids and high pressures in superheated steam. These features, acid resisting combined with drop forged strength, assure safety, endurance, and long service.

The Monel Metal parts are indicated by white arrows in the above cut of the valve.

Continued on Next Page

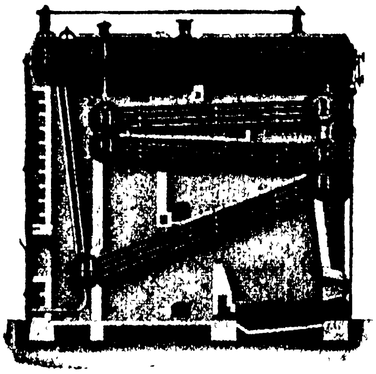
THE VOGT WATER TUBE BOILER

The success of the Vogt Water Tube Boiler is built on the following service rendering features

High efficiency resulting from design of boiler, arrangement of furnace

Counter current circulation, and proper proportionment of gas passage areas

Extremely large steam storage space for fluctuating load



VOGT WATER TUBE BOILER

Low maintenance cost due to absence of all curved tubes and numerous handholes, and freedom of boiler for expansion and contraction.

Easily accessible for cleaning and inspection

Able to "pick up" from dead load to peak load in shortest possible time.

. Manufactured by the most advanced boiler shop practise from highest grade material

The Vogt Water Tube Boiler is constructed in units varying from 250 to 1000 horsepower, and complies in every respect with the A. S. M. E. Boiler Code.

THE VOGT HORIZONTAL RETURN TUBULAR BOILER

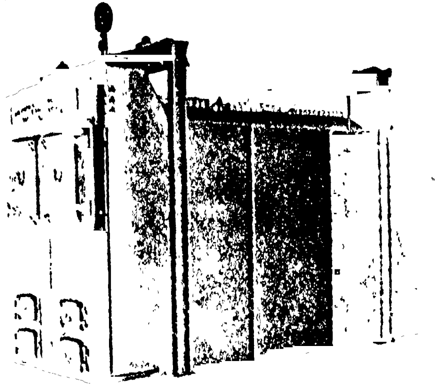
Vogt Horizontal Return Tubular Boilers are constructed in accordance with the new A. S. M. E. Boiler Code for 125 and 150 pounds working pressure and range in capacity from 45 to 250 horsepower.

VOGT HORIZONTAL RETURN TUBULAR BOILER

The equipment is arranged to assure ample space between the grates and the bottom of the boiler, also a large combustion area in rear of bridge wall, thus meeting the present day demand for economical fuel consumption.

THE VOGT SECTIONAL STEEL BOILER CASING

The necessity that more perfect combustion be obtained has made the elimination of the excess air which leaks through brick boiler setting one of the most important features of boiler setting design. The Vogt Steel Casing for Return Tubular and Water Tube Boilers constitutes a decided step towards securing this more perfect combustion, as it avoids all leaks common to brick settings. A considerable saving in the cost of maintenance and in the elimination of expensive delays is effected since the brick lining of the Steel Casing (being tightly sealed) is not subject to the usual expansion and contraction. Excess air means wasted fuel. Stopping the leaks reduces the coal consumption. Coal saved is Dollars saved, which is a direct return upon the investment.



VOGT SECTIONAL STEEL BOILER CASING

VOGT OIL REFINERY EQUIPMENT

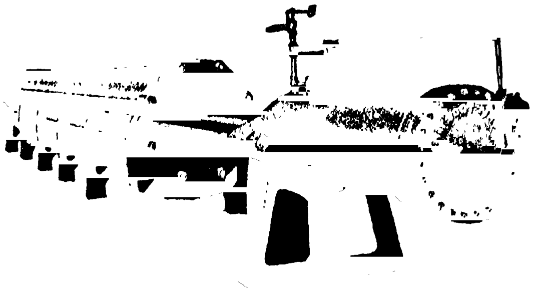
The Vogt Paraffine Wax Press Designed for both efficient and economical service in the work of separating the wax from the wax distillate

It is adapted to filter under pressure of 300 to 500 pounds. The plates are made in either the loose ring or riveted ring type. The press is heavily constructed and the weight evenly distributed. All castings are made of semi-steel.

The Vogt Distillate Chilling Machine—The many installations have proved the excellent working features of this machine. It operates with minimum amount of power.

The distillate pipes (inner pipes) are of wrought iron made in one length. All castings are made of semi-steel.

The Vogt (Riveted) Auto Truck Tank—The salient features of this tank are Riveted Joints—High Grade Steel—Modern Design—Master Workmanship.



VOGT PARAFFINE WAX PRESS

Vogt Tube Pressure Stills—Completely comply with the specifications for pressure vessels of the American Society of Mechanical Engineers. Special equipment made to order.

Bulletins of Vogt Products sent upon request.

VOLAND & SONS, INC.

Established 1888

Manufacturers of Precision Balances and Weights

FACTORY AND OFFICE

NEW ROCHELLE, N. Y., U. S. A.

Incorporated 1920

PRODUCTS

Balances; Assay, Analytical, Pulp, Bullion, Etc.
Scales; Gold and Silver.
Weights; Metric Precision, Gramme, Grain, Avoirdupois, Riders.
Balance Pans, Glass Pans.
Balance Accessories.

PRECISION BALANCES AND WEIGHTS

Our balances and weights have gained an enviable reputation for accuracy, perfect construction and expert workmanship Numerous testimonials and expressions of approval from chemists, chemical engineers, assayers, metallurgists and others are proof of the high quality of our products We make a very complete line and have an instrument suitable for every purpose where a scientific weighing instrument is required.

ANALYTICAL BALANCE NO. 1008-A

Capacity 200 Grams in each pan

Sensibility 1 20 Milligram.

Patented rider-hooks and starting attachment, Red graduated index plate; releasing mechanism is the famous arc movement type; all knives relieved of contact when balance is at rest, Bearings are of finest agate, highly polished, Brass parts heavily lacquered; Concave pans 2½ inches in diameter and wide enough to take a 4-inch dish

The beam is of our hard bronze composition, accurately made and thoroughly tested and provided with perfectly ground knives of finest agate. Beam is 7 inches long, with white graduations on black background

There are 100 divisions on each side of zero.

Dimensions Length 16½ inches, height 19 inches; depth 9½ inches

Shipping weight Domestic 60 lb.; export 70 lb

"TWENTIETH CENTURY LEADER" ASSAY BALANCE

Sensibility 002 Milligram (1-32000 Gram).

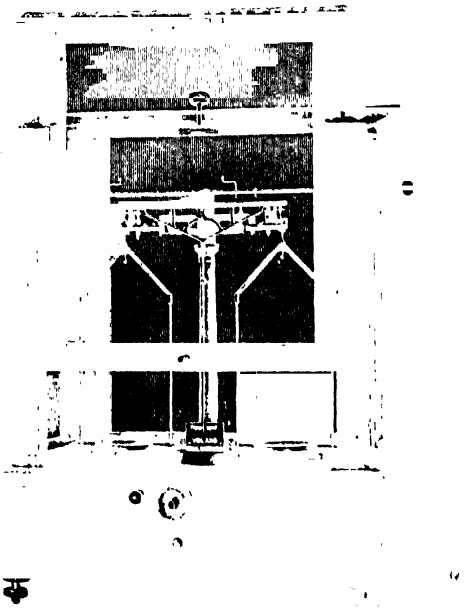
Of the most modern and approved construction of the dwarf column, fallaway type No sticking or kicking of the pointer All knives and bearings are of finest agate, highly polished The construction is non-steel throughout, and practically all the metal parts are heavily plated with gold

The entire balance is mounted on a heavy, black, plate-glass base, located inside the case The mahogany case is as nearly air-tight and dust-proof as it is possible to make it.

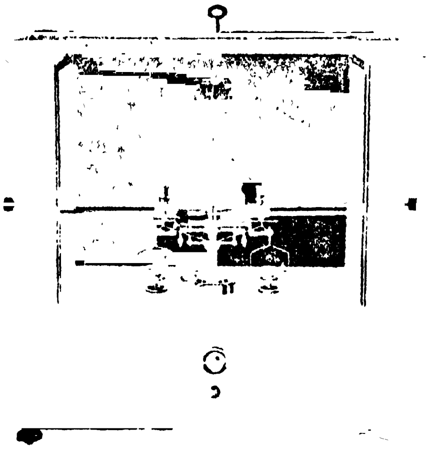
The beam, which is amply reenforced, is of the truss type, made of a hard-rolled, rigid, aluminum alloy. It is graduated into 100 divisions on each side of zero.

Dimensions: Length 16½ inches, height 15½ inches, depth 9 inches.

Shipping weight, 50 lb.; export 60 lb.



ANALYTICAL BALANCE NO. 1008-A



"TWENTIETH CENTURY LEADER" ASSAY BALANCE

VULCAN RAIL & CONSTRUCTION COMPANY

Grand Street and Garrison Ave.
MASPETH, N. Y.

PRODUCTS

Steel Plate Construction.

Light Structural Steel Work.

Steel Framing and Supports for Tanks.

Stills, Evaporators, and other chemical equipment as well as Hoppers, Conveyors, and Elevators, etc.

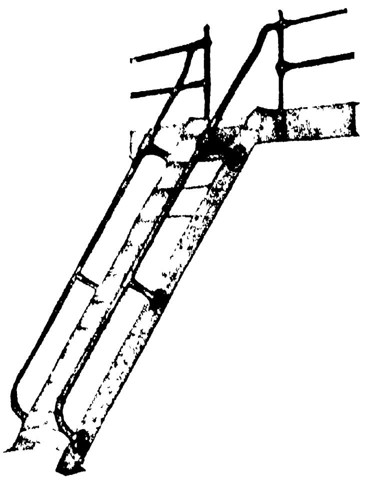
Steel Gratings, Walkways, Ladders, Stairs, Galleries, etc.

Pipe, Stair and Bridge Railings.

Special Pipe Bends.

Complete Piping for carbon black plants.

Special pipe construction.

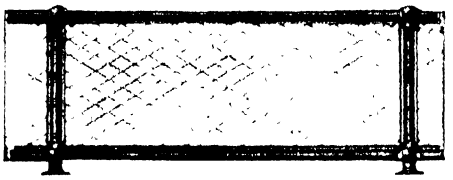


STAIRS WITH BALCONY AND RAILINGS

SERVICES

We will gladly cooperate with engineering firms when they are building industrial plants, or installing machinery, with the view to supplying them with designs and costs of our products that will fit any requirement

We carry complete stocks from which to supply the demand for the largest of installations of pipe railings and special steel work.



A BOARDWALK RAILING

FACILITIES

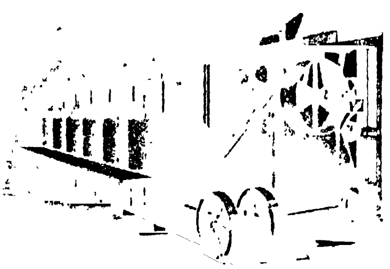
We have a plant comprising machine shop, forge shop, pipe shop, fabricating shop, pattern shop, together with railroad sidings for handling the largest orders for any of our products.

Our engineering and estimating departments are experienced in handling the unusual in steel construction.

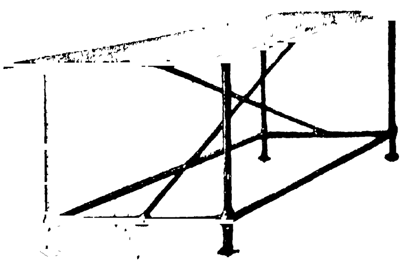
RAILING FOR CONCRETE STAIRS

SPECIAL MACHINERY

Our engineers build, when required, special machinery for fabricating unusual designs of steel equipment. When you have a difficult problem requiring study and which you are puzzled where to purchase we would be very glad to have you consult us as we have specialized in making or fabricating special machinery or steel framing to meet any requirement



SPECIAL STEEL EQUIPMENT



PIPE FRAMES FOR BENCHES AND TABLES

PRICES

We will be very glad to make up estimate of costs and submit preliminary designs for any special equipment you may require.

J. H. WAGNER

Engineers and Contractors for
Air Handling Equipment & Sheet Metal Construction
191 SPENCER STREET, BROOKLYN, N. Y.

PRODUCTS

Ventilating Installations, Dust Collecting Systems. Drying and Conveying by air, Air separation and screening, Fans and blowers.

Sheet metal piping, Smokestacks and breechings, Tanks, pans, bins, guards, fireproofing special sheet metal utensils, etc.

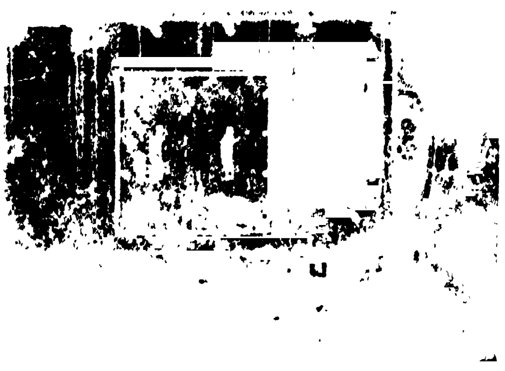
DUST COLLECTION AND ODOR ELIMINATION

We will advise on design or construct either centrifugal, bag or cloth collectors or spray collectors or combinations as desirable.

WET PROCESS DUST COLLECTOR

We have developed a water spray collector of maximum simplicity and efficiency in which the spray is mechanically maintained at a high intensity. It occupies no useful floor space and the capacity in cu. ft of air is high. Particularly adapted for collection of fine or impalpable powder.

30" 12-BLADE DISC FAN
Thrust Bearings Flexibly Mounted



WET PROCESS DUST COLLECTOR
3 ft x 3 ft x 7 ft Capacity 9000 Cu Ft per Min

VENTILATION EQUIPMENT

Seventeen years' experience in ventilating problems ranging from a telephone booth to a modern hotel backs our judgment as to what is theoretically desirable and what is practically possible. Our knowledge of what can be done to be effective, of various expedients and short cuts is offered to prospective clients. 90% of the design of ventilating equipment is reconciling apparatus limitations to working conditions and this knowledge is ordinarily not to be expected of Plant Managers. Write us fully as to existing conditions with plans or sketch of building and we will be glad to advise and arrange for a representative to call if practicable.

AIR SEPARATION

We have been able to effect remarkable economies in cleaning materials from foreign substances as well as grading or sifting by means of air without the use of screens. Send us what data you have with a sample of material and quantity per hour to be treated.

WAILES DOVE-HERMISTON CORPORATION

FORMERLY AMERICAN BITUMASTIC ENAMELS COMPANY

Manufacturers of Anti-Corrosive Paints and Compositions

GENERAL OFFICES

BITUMASTIC 17 BATTERY PLACE, NEW YORK, N. Y. **HERMASTIC**

BRANCH OFFICES

[illegible] [illegible]

PRODUCTS

BITUMASTIC and HERMASTIC Solutions, Paints, Enamels, Mastics and Special Bituminous Compositions. Protective paints and coatings for iron, steel and concrete exposed to atmospheric moisture, electrolysis, acids, acid fumes, sewage, brine, alkalis, etc., buried in the ground or submerged in fresh, salt or acidulated water.

BITUMASTIC AND HERMASTIC COMPOSITIONS

These compositions are of a bituminous base from which have been eliminated the ingredients that limit the life and usefulness of ordinary coal tar and asphaltum compounds. The treatment received in manufacture reinforces the preservative properties of the bitumens by exceptional physical properties—i. e., toughness, tenacity, and durability—which are retained throughout a far broader range of temperature and under more severe mechanical distortion and abrasion than have generally been considered to be within the scope of bituminous compositions.

BITUMASTIC SOLUTION

An anti-corrosive Solution, supplied ready for use, and brushed on cold in the same manner as paint. A black coating that bonds firmly to metal and masonry, and effectually resists the corrosion caused by continuous exposure to the weather, under extremes of heat and cold, corrosive fumes, etc. It will neither chip off nor crack in service. The Solution is a dampproofing for concrete walls and floors, vat house ceilings, etc. It is extensively used also for the protection of structural steel, condenser coils, cooling towers, boiler fronts and breechings, smoke stacks, bridges, corrugated or sheet metal buildings and roofs, steel window sash, tanks, standpipes, etc.

Covering Capacity—On metal surfaces 300 sq. ft. per gallon one coat; 200 sq. ft. per gallon two coats.

BITUMASTIC LIQUID PAINTS

Protective paints that possess all the preservative qualities of the basic bitumens while they avoid the uniform black color that has hitherto limited the usefulness of ordinary bituminous paints and compositions.

Colors—Made in Red, Brown, Stone and Green.

Covering Capacity—Spread easily, and on ordinary structural steel cover at the rate of about 350 square feet per gallon in two coats. Dry quickly, forming a tough, elastic film of full body and attractive surface, with just a pleasing gloss.

Uses—Designed for the use of chemists, engineers, architects and industrial executives who must protect their structures against moisture, cement alkalis, and corrosive vapors and fumes. Recommended for:

Steel bridges, buildings and tanks.

Steel framing and sheet steel siding for industrial buildings.

Metal roofs, gutters and eave spouts.

Iron fences, fire escapes and ornamental iron work.

Window sash, ventilators, skylights.

Wrought iron pipe and fittings.

HERMASTIC ENAMEL

A protective coating against the most severe conditions including hot acids, alkalis, salt water, fumes and electrolysis. It will neither crack nor chip during the cold of winter nor run or sag under summer heat. It resists distortion, expansion and other mechanical strains that occur in industrial construction.

Application—It is applied hot over a priming coat of Solution which is brushed on cold, and forms an effective and durable coating about 1/16″ thick as usually applied. It may be applied either by dipping or brushing. Full printed directions accompany each shipment.

Hermastic Enamel is chemically inert with respect to most substances; it is impermeable to moisture, clings tenaciously to all surfaces; is ductile and pliable; and is an electrical insulator. The following applications in the chemical industry indicate the diverse uses to which these coatings may be effectively applied:

Chemical and Dye Plants: Pulp and Paper Mills:
- Acid-resisting covering for floors.
- Protection of steel exposed to fumes, gases, liquids, and corrosion generally.
- Protection of metal structures and vats.

Soap Factories and Glycerine Refineries:
- Protection of buildings, basins, tanks and storage vats.

Tanneries:
- Coating of tanning basins and tanks, pipes and structures.

Ice Plants:
- Protection of brine tanks, ammonia and condenser coils, and circulating pipes in ice reservoirs.

Gas Works:
- Protection of tanks and metal structures from hydrogen sulphide.

Electrolytic and Leaching Plants for Extraction of Metals:
- Protection of structures from sulphurous and arsenic fumes.

Hydro-electric and Electrochemical Plants for the Treatment of Ores:
- Waterproofing and insulation of tanks, apparatus.

Packing Industries:
- Protection against albuminoids, proteids and chlorides.

Fertilizer, Storage and Manufacturing Plants:
- Dampproofing of structures, coatings for phosphoric acid vats, phosphate treatment, general piping, etc.

Cold Storage Plants, Dairies, Creameries, Sugar Refineries:
- Applied on steel and concrete as a sanitary protection against moisture.

Mining Works:
- Protection of all metallic surfaces from acids.

Tank Cars:
- For the transportation of chemical products.

We shall be glad to consult with Chemists, Engineers and Industrial Executives as to the possibility of our coatings helping to solve their corrosion problems.

THE WALSH & WEIDNER BOILER COMPANY

Manufacturers of Boilers, Tanks, Structural Steel Work

Factory and General Offices

CHATTANOOGA, TENN.

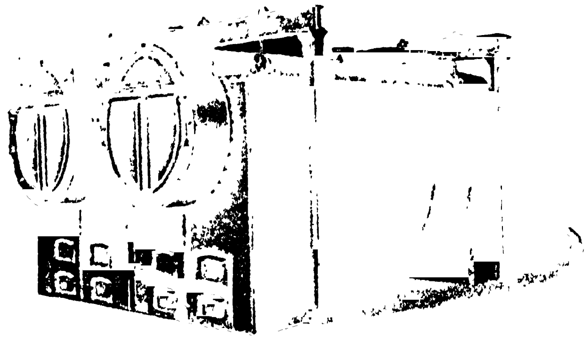
BRANCH SALES OFFICES

New York New Orleans San Francisco Memphis Havana Cuba

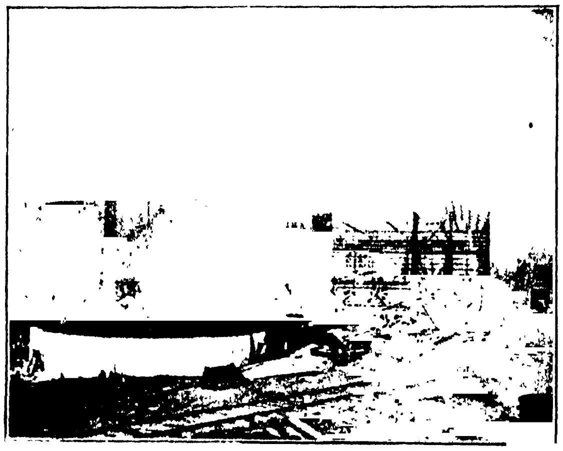
PRODUCTS

Horizontal Return Tubular Boilers, All Types

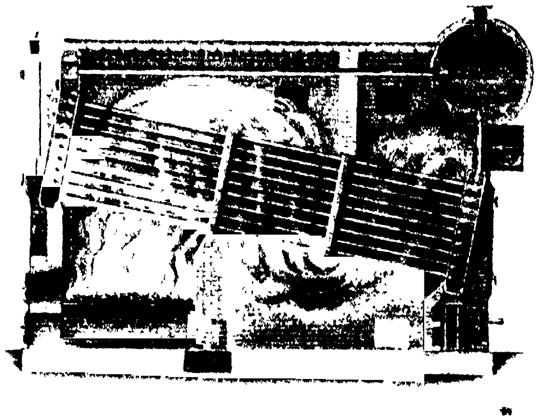
- Water Tube Boilers
- Steel Casings for Boilers
- Storage Tanks
- Pressure Tanks
- Acid Tanks
- Tar Tanks
- Pneumatic Tanks
- Sulphuric Acid Tanks
- Alcohol Tanks
- Benzol Tanks
- Ammonia Tanks
- Molasses Tanks
- Sugar House Tanks
- Oil Storage Tanks
- Sugar Crystallizers
- Scum Tanks
- Sugar Defecators
- Gasoline Tanks
- Rendering Tanks
- Agitators
- Oil Stills
- Benzol Washers
- Gas Coolers
- Storage Bins
- Blast Furnaces
- Blast Furnace Stoves
- Gas Piping
- Steel Riveted Piping
- Towers and Tanks
- Structural Steel Work
- Standpipes
- Smokestacks
- Steel Breechings
- Plate Steel Work



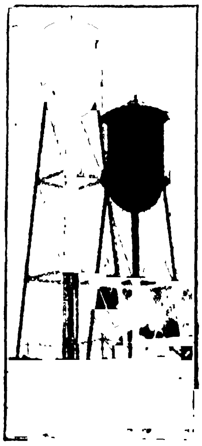
HORIZONTAL RETURN TUBULAR BOILERS IN STEEL CASING SETTING



TAR TANKS AND BUILDING ERECTED BY US IN BY-PRODUCTS PLANT



CROSS DRUM WATER TUBE BOILER
All Types Manufactured



TOWERS AND TANKS

SERVICES

We make a specialty of building all kinds of special tanks and plate iron work to suit the requirements of chemical and engineering plants. We furnish and erect complete all tanks, plate iron and structural material for complete chemical plants, blast furnaces, and other industrial plants.

THEO. C. WALTER, JR.

Copper and Aluminum Apparatus

13-15 ESSEX STREET, NEWARK, N. J.

PRODUCTS

Copper and Aluminum Stills: Direct Fire, Coil and Oil or Steam Jacketed.

Columns: Bell or Sieve Construction.

Condensers: both Tubular or Coil Type.

Mixing Kettles

Vacuum Pans

Evaporators

Extractors

Expansion Joints

Jacketed Kettles

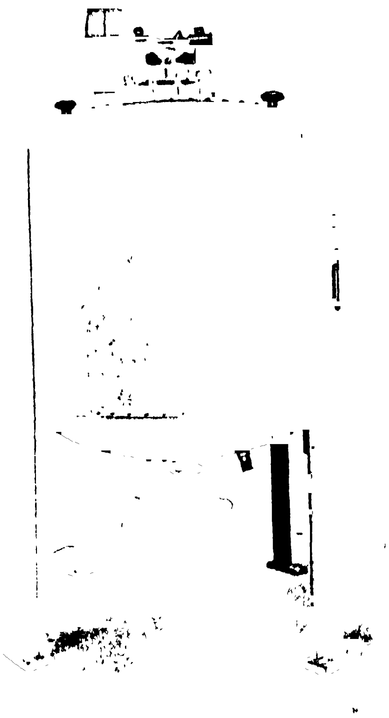
Dye Kettles

Coils: Plain, Lead Covered or Block Tin Lined Lead.

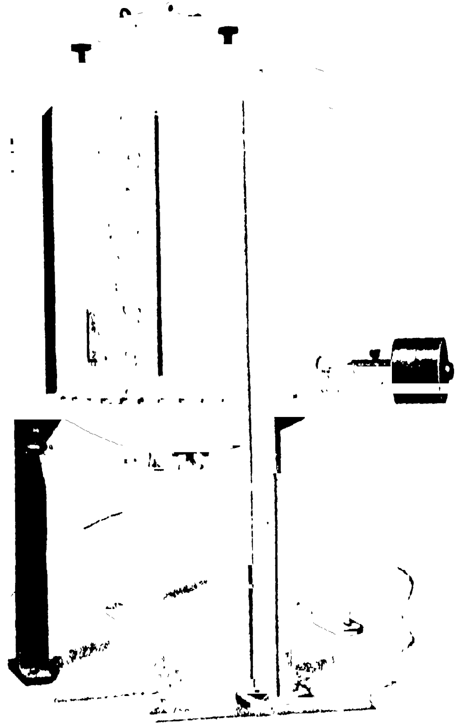
Tin Lined Apparatus.

ILLUSTRATIONS

The illustrations show special installations of heavy copper work, recently built.

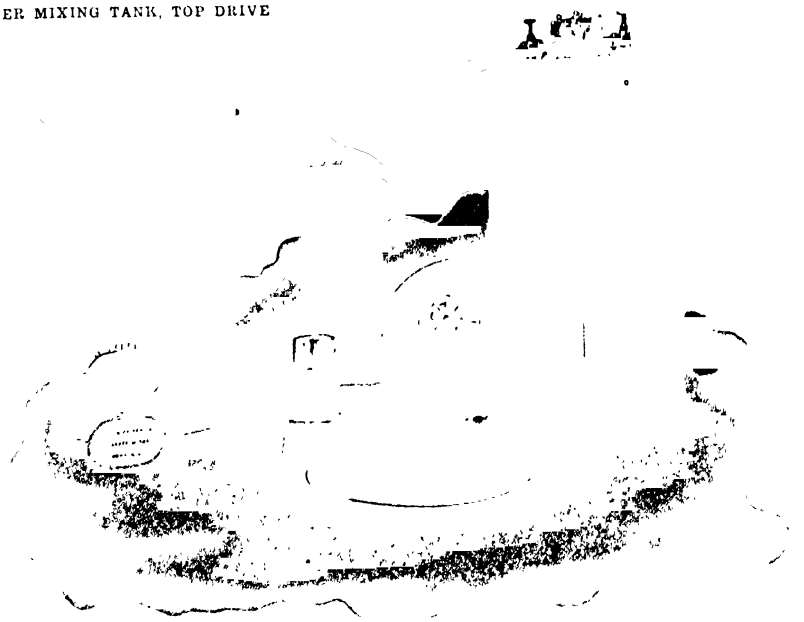


COPPER MIXING TANK, TOP DRIVE



COPPER MIXING TANK, SIDE DRIVE

CONTINUOUS STILL, BELL COLUMN



COPPER WOOD EXTRACTION APPARATUS, ONE OF BATTERY

O. I. WARING FILLING MACHINE CO.

Patented Filling and Depositing Machinery
59 Fourth Avenue
NEW YORK, N. Y.

PRODUCTS

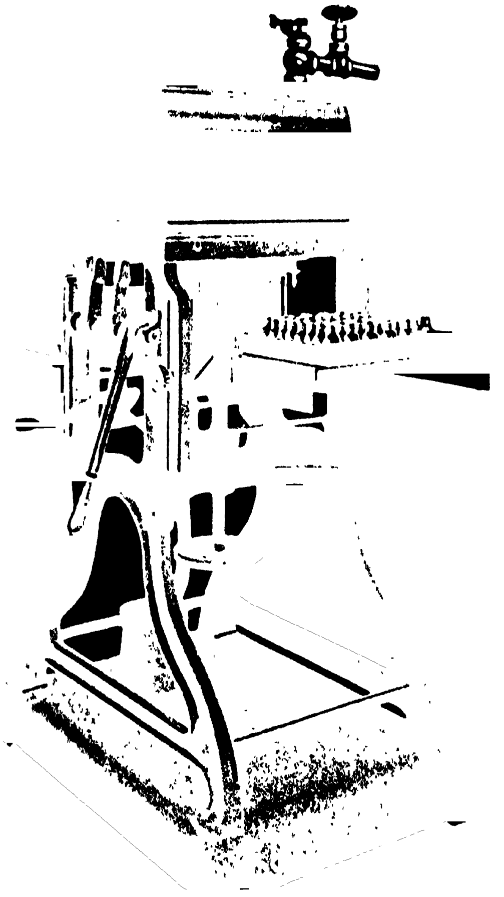
Machines for Filling and Depositing a Wide Variety of Products into any Style of Container; Bottles, Tins, Cans, Paper, etc.

USES

Our machines are successfully being used by a number of firms for filling liquids, semi-liquids, volatile liquids and viscous products, such as

- Pharmaceuticals
- Food Products
- Syrups
- Candy
- Salves
- Cold Creams
- Ointments
- Liquid Collodion
- Oils and Greases
- Specialties
- Waxes
- Paint
- Varnish
- Inks
- Shoe Polish

Products containing suspended materials, such as, Milk of Magnesia, Medicated Ointments, etc



SPECIFICATIONS, TYPE B MACHINE

For small bottles phials or containers with narrow necks

This machine fills up to 100 containers depending on the size, with one single stroke

Capacity—Up to 300 or more containers per minute, depending on size

Height 5 feet

Floor Space 2 feet by 4 feet

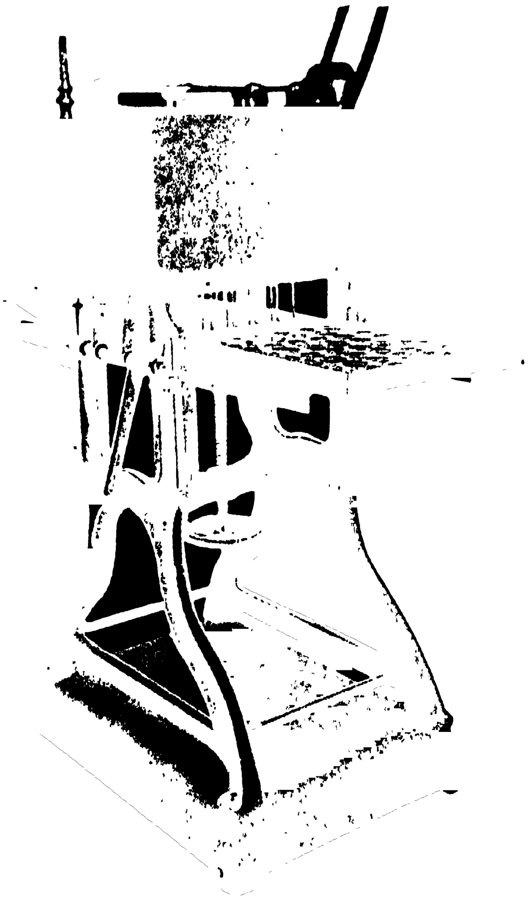
Weight—Approximately 500 pounds

GENERAL CONSTRUCTION

Sanitary

Initial cost only cost

No repairs, due to the construction, which is the simplest of any filling machine on the market, there being no tubes, springs, washers, pumps and frail parts to get out of order



SPECIFICATIONS, TYPE O MACHINE

For depositing Salves, Cold Creams Waxes etc

This machine takes care of all products which must be filled or deposited hot or warm It is equipped with a double jacketed copper filling reservoir furnished with steam connection Electric heaters can be used in place of steam

A mechanical agitating device is also furnished to keep products containing suspended materials well mixed and the temperature uniform throughout

It fills 24 or more containers with one stroke

Capacity—Up to 240 containers per minute

Height—5 feet

Floor Space—2 feet by 4 feet

Weight—Approximately 500 pounds

Can also be furnished with individual motor

"Waring for Wearing Qualities."

THE WARNER CHEMICAL COMPANY

Manufacturers of the Nelson Electrolytic Chlorine-Caustic Soda Cell
52 VANDERBILT AVE., NEW YORK, N Y

PRODUCT

The Nelson Electrolytic Cell.

USE

The Nelson Electrolytic Cell produces Chlorine Gas, Liquid Caustic Soda and Hydrogen of the highest purity for any industrial purpose requiring them.

ADVANTAGES

Low investment, economy of floor space, purity of products, quick shut down or intermittent operating facilities, long life of diaphragms and anodes, no moving parts, everything except electrodes and diaphragms practically indestructible, no appreciable drop in efficiency from year to year, simplicity of construction and operation, minimum labor and power per pound of product.

GUARANTEE

We are prepared to prove by actual demonstration to those interested, that the Nelson Cell is superior to any other Electrolytic Chlorine-Caustic Soda Cell. Its reliability, uniformity and efficiency, and high quality of products, combined with its low cost of installation, operation and repairs, make it the leader in its field. There are more Nelson Cells installed and producing Chlorine than any other make of cell in the world.

Detailed instructions are given to those who install Nelson Cell plants, which, if followed, will result in much higher efficiencies than those guaranteed. The guarantees have been bettered in every installation made.

ESTIMATES

We will furnish estimates for a complete installation giving the cost of producing chlorine Advise us the amount of chlorine required with the cost of power, salt and labor

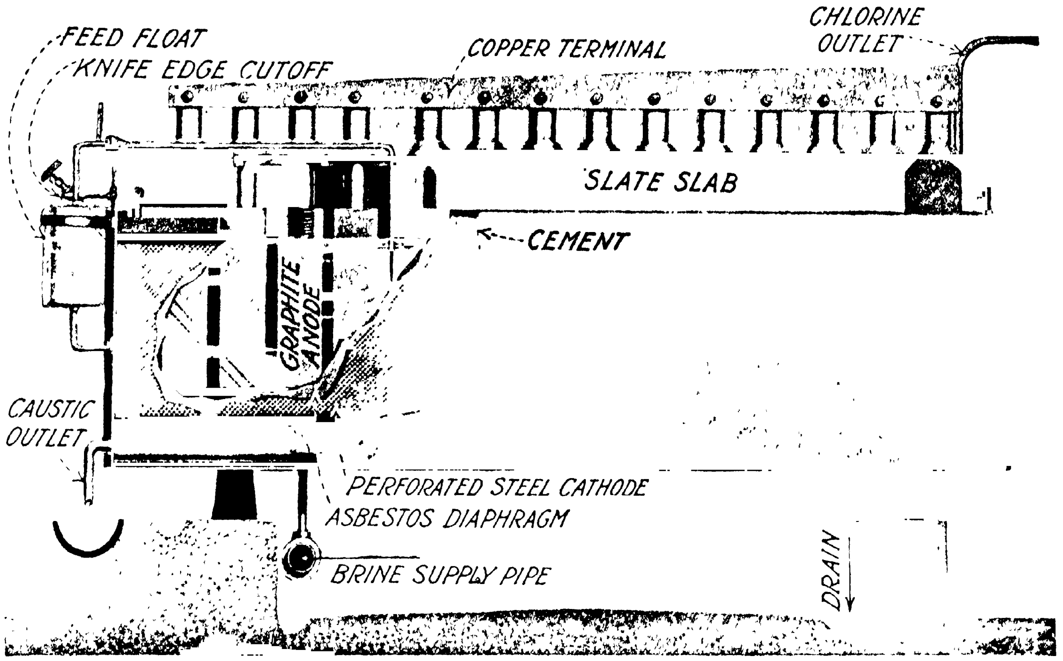
USERS

Large numbers of Nelson Cells are in use in the United States and abroad in chemical plants, paper mills, oil refineries, detinning and water purification plants, and other industries requiring cheap and reliable chlorine or caustic in quantity.

INSTALLATIONS

A partial list of our users includes

Baltimore Copper Smelting & Rolling Co.
Chan To Salt Refining Co, China
E I du Pont de Nemours & Co
Fields Point Mfg Co
Gulf Refining Co
Hammersley Mfg Co
Howard Smith Paper Mills, Ltd
Igglesund Bruk, Sweden
Kellner-Partington Pulp & Paper Co, Norway
Kotaro Shimomura, Japan
Mead Fibre Co
Montclair Water Co
Mount Morgan Gold Mining Co, Australia
Nankai Sarashiko, Japan
Dicson Wood Co, Finland
Republic Chemical Co
Riordon Co, Ltd, Canada
Roessler & Hasslacher Chemical Co
Rollin Chemical Corp
Semet-Solvay Co
Societé Industrielle De Chimiques, S A.
Southern Reduction Co
Titahgus Paper Mills Co, Ltd, India
U S Government
Warner-Klipstein Chemical Co



DETAILS OF NELSON ELECTROLYTIC CELL

WARREN CHEMICAL DIVISION

THE BARRETT COMPANY

Acid and Alkali Resisting Floors, Roofing and Waterproofing

17 Battery Place

NEW YORK, N. Y.

PRODUCTS

Acid-proof Anchor Rock Asphalt Floors; Acid-proof Asphalt Filler for brick and tile floors; Acid-proof Paints, Tank Linings, Roofings and Roof Coatings.

ACID-PROOF ANCHOR ROCK ASPHALT FLOORS

The economical maintenance of factory floors subject to acid and alkali solutions has long been recognized as a most serious problem.

While many types of floors are more or less acid-resisting and often serve remarkably well under trying conditions, nevertheless the margin of safety decreases with the increasing strength of the acid solutions

To provide a floor having all the other well-known advantages of rock asphalt mastic, yet immune against the corroding action of the acid and alkali solutions generally used,* we offer a super acid-resisting grade known as **Acid-proof Anchor Rock Asphalt Mastic.** It is elastic, silent, tough, durable, dustless, non-absorbent, sanitary and waterproof, monolithic—unbroken by joints; affords remarkably sure foothold, can be laid over wooden or cement floors and can be used as soon as it has cooled, usually three or four hours. This eliminates protracted interruptions, so costly in busy plants Cuts made in Rock Asphalt Floors because of alterations are quickly and easily repaired. The fresh hot mastic bonds perfectly with the old floor, preserving its monolithic character.

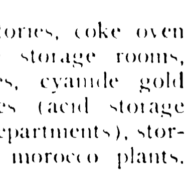
ADAPTABILITY

For bleacheries, chemical laboratories, coke oven plants (saturator houses, sulphate storage rooms, dryer platforms), copper refineries, cyanide gold plants, nickel platers, oil refineries (acid storage rooms), steel mills (metal pickling departments), storage battery rooms, tanneries and morocco plants. Also plants making aniline, caustic soda, drugs, medicines, dyes, explosives, fertilizers, heavy chemicals, paper pulp and soap.

ACID-PROOF ANCHOR ROCK ASPHALT MASTIC

A super alkali- and acid-resisting combination of natural asphalt and crushed rock tempered with natural asphaltic fluxes to a uniform consistency. When properly mixed with clean, sharp, alkali- and acid-proof sand and grit (see specifications), produces a wearing surface superficially resembling cement, but much superior because of certain desirable qualities above mentioned.

In round cakes weighing about 50 lbs., and branded as per illustration.



CAKE OF ACID-PROOF ANCHOR ROCK ASPHALT MASTIC

WARREN'S NO. 1 HARD FLUX

A fluxing agent with a hardening tendency. Used where floors are to be subject to high natural or artificial temperatures. In barrels weighing about 400 lbs. each. Barrels are stenciled "Warren's No. 1 Hard Flux"

WARREN'S BITUMEN OR SOFT FLUX

A fluxing agent with a softening tendency Used where floors must remain elastic under reduced temperatures. In barrels weighing about 525 lbs. each. Barrels are stenciled "Warren's Bitumen."

SPECIFICATION FOR ACID-PROOF ANCHOR ROCK ASPHALT FLOORS

(To follow specifications for concrete or wood foundation): ‡

All grades shall be properly established before the mastic is laid, so that latter shall be of uniform thickness

By weight, the mixture shall consist of.

	From	To
I Warren's Bitumen or No 1 Hard Flux	9%	5%
II Acid-proof Anchor Rock Asphalt Mastic §	55%	57%
III Sharp, dry, alkali- and acid-proof sand and grit ¶	36%	38%
	100	100

The Mastic to be brought to the work in the original branded cakes, and the Bitumen, or No 1, in the original barrels The sand and grit to be dry, sharp and so graded that the voids shall be reduced to a minimum, no particles to run over ¼ in in size The proportions of all ingredients, within the above limits, to be subject to the approval of the engineer

These materials to be charged into kettles in this order I, II and III I and II to be melted before the addition of III All to be mixed in the usual manner (the kettle temperature at no time to exceed 400° F), and spread at a temperature of from 325 to 350° F, so that finished floor shall have a uniform thickness of * 1½ in †

After spreading, and as the hot mastic cools and sets, it shall be lightly sprinkled with fine, hard sand and rubbed to a smooth surface finish with the usual smoothing tools or floats

The engineer reserves the right to reject any bid or bids; and the name of the contractor or subcontractor who is proposed to lay this floor must be submitted to him and receive his approval before the work can proceed

NOTES FOR ENGINEER –

‡ (a) Over wood foundation specify that a sheet of building paper first be laid

§ (b) Where no special protection against alkalis or acids is important, change to "Anchor Rock Asphalt Mastic"

¶ (c) Where no special protection against acids or alkalis is important, omit the words "alkali and acid proof"

* (d) This can be changed to any thickness between 1 and 2 ins., depending upon traffic expected, 1 in is sufficient for ordinary foot traffic

† (e) If finished floor is to be over 1 in thick, insert here, "Mastic to be laid in 2 layers of equal thickness, breaking joints"

(f) It is usually estimated that 1 sq ft of finished floor 1½ ins. thick weighs about 18 lbs., 1 in thick about 12 lbs Apply above percentages to ascertain quantities of materials required for any given area

(g) We recommend that the full text of the specifications be used If, however, an abbreviated form is desired, we suggest "Floors shall be Warren's Acid proof § Anchor Rock Asphalt Mastic,* laid strictly in accordance with the printed specifications revised June 1, 1916, using the materials specified"

ANCHOR ACID-PROOF PAINT

For protecting brick or concrete walls; also metal surfaces against the action of dilute acids and alkalis. Particularly adaptable for painting storage battery boxes.

---

* All solutions up to 25 to 30% strength Concentrated solutions so seldom find their way onto floors that the problem of dealing with them seldom arises For advice in this connection, please communicate with us.

THE WARREN CITY TANK & BOILER COMPANY

Fabricators and Erectors of Steel Tanks and Plate Work

WARREN, OHIO, U. S. A.

Cable Address "TANKS" Warren Western Union Code

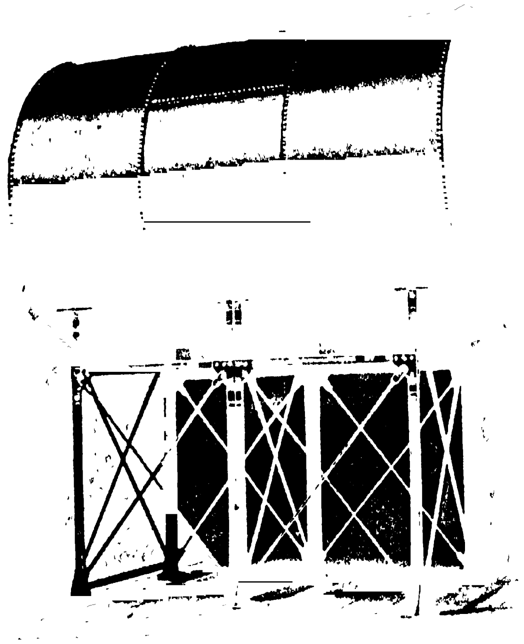
PRODUCTS

Steel storage tanks and steel plate work of every description, standpipes, grease kettles, annealing boxes, elevated tanks, smokestacks, riveted pipe, and many other products which have to do with fabrication and plate work.

TANKS

Any size, any purpose, erected anywhere.

Estimates furnished promptly, and assistance given in designing and planning your work.



CYLINDER TANK ON STEEL ELEVATION

FACILITIES AND ORGANIZATION

The Warren City Tank & Boiler Co have one of the most modern and up to date plants in the country for handling the class of work mentioned, and the machinery used is of the latest type This company maintains a large staff of expert engineers and erectors and your difficulties can be solved without any worry to you Giving satisfactory service for twenty-nine years is evidence that the products turned out by them must be right, and should inspire the utmost confidence

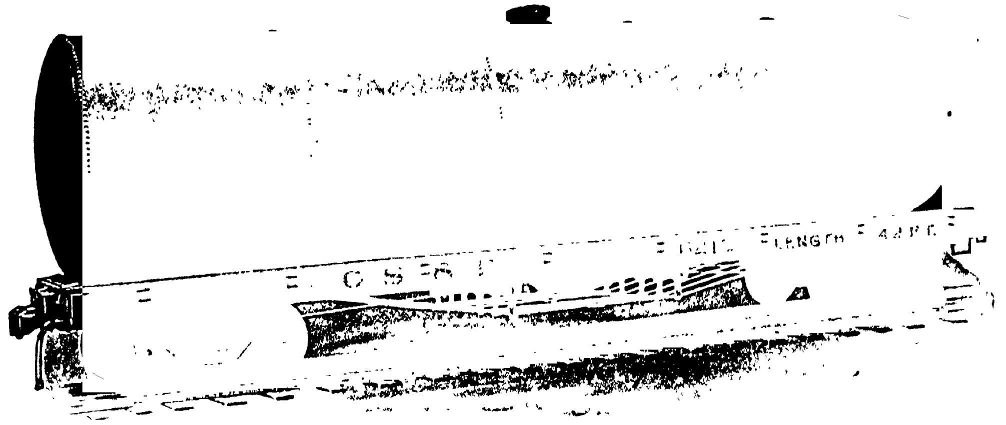
SCOPE OF MANUFACTURE

The Warren City Tank & Boiler Co. fabricates, builds and erects all kinds of steel tanks, and is prepared to undertake any construction or fabrication involving plate work. It makes a specialty of tanks for the storage of oils, acids, grain, water, molasses, alcohol, and other chemicals, its facilities enabling it to build tanks with capacities varying from 500 to 75,000 barrels (80 to 11,900).

DELIVERIES, SHIPPING AND PACKING

Large quantities of raw materials are carried in stock at all times, prompt deliveries can ordinarily be made on even the largest orders Tanks are shipped knocked down, carefully packed, crated and marked so as to prevent damage in transit; this especially applies to foreign shipments.

When circumstances warrant the Company is prepared to do the erecting wherever desired, such work being supervised by expert engineers.



ACID TANK

WATSON & McDANIEL CO.

ESTABLISHED 1878

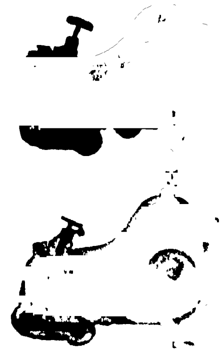
Steam Traps and Steam Controlling Appliances

146 N. 7th Street, PHILADELPHIA, PA.

PRODUCTS

Steam Traps; Reducing Valves for steam, water, air and gas; Pressure Regulating Valves; Pump Governors; Relief Valves; Ejectors; Separators for High Pressure and Exhaust steam; Hydraulic Valves; Strainers; Suction Tees.

McDANIEL IMPROVED STEAM TRAPS



McDANIEL IMPROVED STEAM TRAP

Will discharge the condensation without wasting any steam. They have large outlet valves and are not liable to be flooded from sudden flushes of water The copper floats are made specially heavy and are seamless. The weight of the float holds the outlet valve closed and the valve opens in the direction of the flow of condensation. In this construction we can use heavier floats and larger discharge valves. The Traps are simple in construction and easily taken care of. The water gage on the side shows the proper operation of the traps. They are put together with a few bolts conveniently set in slots. All the working parts are attached to the bonnet which can be removed for repairs without breaking any pipe joints, as these are all connected to the body of the trap. They should be used in all places where condensation will collect, draining steam heating apparatus, steam coils, coil dryers, dry boxes, vacuum pans, kettles, cooking urns, steam tables, paper calendering machines, and similar uses where drying is done by steam. Should also be used on all bleeders from main steam lines and steam separators.

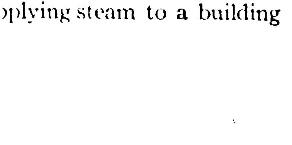
SPECIFICATIONS McDANIEL IMPROVED STEAM TRAP

Trap no	Size inlet and Outlet standard pipe size	Drainage lineal ft of 1 in pipe	Drainage sq ft of Heating surfaces	Capacity lbs of water per hour 125 lbs pressure	Price
12	½ in	500	166	1 000	$12 00
13	¾ "	1,500	500	3 000	18 00
14	1 "	4,000	1,333	8,000	30 00
15	1¼ "	8,000	2,666	16,000	40 00
16	1½ "	15,000	5 000	30 000	60 00
17	2 "	20,000	6,666	40,000	80 00
18	2½ "	25,000	8 333	50 000	100 00

These are suitable for steam pressures up to 125 pounds. Also made extra heavy for 125 to 300 pounds pressure

WATSON REDUCING VALVE

With lever and weight for steam heating or other places requiring low, steady steam pressure.



WATSON REDUCING VALVE, FOR STEAM ONLY

On a heating system or anything requiring a steady pressure the valve will adjust itself to feed in just enough steam to keep up the pressure wanted. As the valve is controlled entirely by the low pressure side, variations on the boiler will have no effect upon the pressure on the heating system. Also, if a reducing valve should be supplying steam to a building where, say half of the radiators are in use, and then a few more are turned on, the reducing valve will open wider, so as to let in more steam to supply the increased demand made on the low pressure system, thus insuring a steady pressure on low pressure side at all times The valve is solid metal throughout all its parts, and there is nothing about it to break or give out just at a time when the valve is most needed.

Made in sizes ½ to 6 inches to reduce steam pressures from 150 lbs. or less to any low pressure desired from 1 to 25 lbs. on the outlet

WATSON SINGLE SEAT PILOT REDUCING VALVE

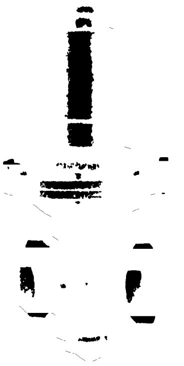
PILOT REDUCING VALVE

Will reduce steam pressure from 100 lbs to pressure as low as 2 lbs. if desired and from 200 lbs. to pressure as low as 10 lbs. on the outlet.

Will reduce to any lower pressure as stated and up to 80% of initial or inlet pressure.

This is our latest pattern reducing valve. All parts are renewable and can be replaced with little trouble. This is the best to use for particular places where it is important to have little or no variation in the outlet or low pressure sides. Especially adapted where the consumption of steam is variable, such as steam presses, steam tables, and furniture and tire presses, etc.

WATSON AIR AND GAS REDUCING VALVE



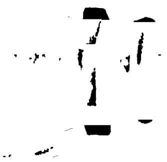
AIR AND GAS REDUCING VALVE

Style "B." This valve is made special for use on Air or Gas, and works very accurately, where low pressure is wanted.

For reducing from any initial pressure not above 200 lbs , and to maintain any pressure wanted between 1 and 25 lbs , on the reduced side. Made in sizes ½ to 2 inches.

In ordering reducing valves, it is always best to state the high pressure and low pressure wanted on the outlet. We make reducing valves for all purposes.

W. & McD. SYPHON PUMP



SYPHON PUMP

Operated with steam pressure for elevating liquids from one level to another; with 60 lbs. of steam it will force 60 feet high.

It is symmetrical in design and small in size, so it can be used in places where saving of space is an object.

It will be found indispensable where tanks are to be pumped out or filled.

It requires no adjustment; simply connect pipes of the proper sizes, and all is ready to work. To start syphon, open steam valve. Made in sizes ½ to 3 inches.

THE WATSON-STILLMAN CO.

Engineers and Builders of Hydraulic Machinery
56 CHURCH ST., NEW YORK, N. Y.
Works at Aldene, Union County, N. J.

SALES OFFICES
Philadelphia Widener Bldg
Chicago McCormick Bldg

PRODUCTS

High Pressure Hydraulic Pumps, Intensifiers, Cylinders, Valves, Fittings; Hydraulic Presses for Testing, Forming, Forcing, Extruding, Dehydrating, Briquetting, Baling, Cupping and Drawing, and other apparatus for special operations.

SPECIAL SERVICE

We are constantly designing and building appliances and apparatus for the chemical and allied industries where the requirements are special and only the greatest accuracy is acceptable. Our apparatus is recognized as standard by many leading technical institutions and commercial organizations, as well as by the United States Government. Our experience of over 70 years qualifies us to handle your requirements no matter how exacting.

HYDRAULIC VALVES AND FITTINGS

Our line embraces an almost endless number of combinations designed to meet the varied requirements of hydraulic systems. Our valves are designed to perform their functions with ease and rapidity, the materials are the best obtainable and each valve or fitting is tested far beyond its listed strength before shipping.

OPERATING VALVE

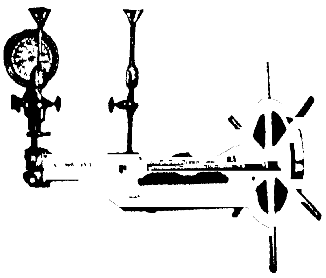
HIGH PRESSURE PUMPS

Our line of pumps is so diversified that a standard can be found for practically every power demand. Every piece of material is of the highest grade procurable; the parts are heavy, the bearings are large, the oiling systems are simple and practical. The valves and all working parts are in accessible positions.

HIGH PRESSURE GEARED FOUR-PLUNGER PUMP

TESTING MACHINES

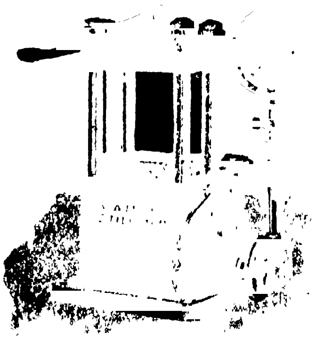
We show here a testing machine for subjecting gas containers to an internal hydraulic pressure. We build these in several sizes either hand or power driven. We also build a line of machines for testing tubes and pipe.



STURKE-WATSON STILLMAN TESTING MACHINE

HYDRAULIC PRESSES

The press shown here is a small machine for laboratory work. While it is but 27 inches high, it is capable of developing a pressure of 35 tons. We build presses for a variety of purposes — baling, extruding, dehydrating, briquetting, forcing, etc.



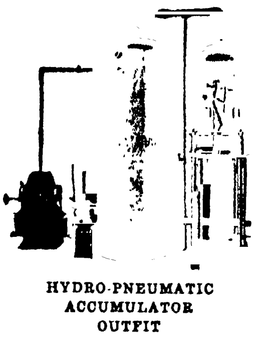
HYDRAULIC LABORATORY PRESS

HYDRAULIC ACCUMULATORS

We build accumulators in several types, designed to fill the requirements of location or working conditions. We illustrate here our hydro-pneumatic accumulator, in which air pressure is used to take the place of weights. It is very light for its capacity; can be installed on upper floors and does not need heavy foundations or great headroom

COOPERATION

We are ready to quote on your own specifications or design to meet your conditions. Tell us what your problem is and we will give you the benefit of our 70 years' experience.



HYDRO-PNEUMATIC ACCUMULATOR OUTFIT

THE WEBSTER M'F'G COMPANY

Machinery for Handling Materials and Products

1500-1560 CORTLAND ST., CHICAGO

FACTORIES: Tiffin, O., Michigan City, Ind., and Chicago — SALES OFFICES IN PRINCIPAL CITIES

PRODUCTS

Conveyors, Elevators, Buckets, Chain, Elevator Equipment, Car Hauls, Trippers, Screens, Crushers, Transmission Machinery, Gears, Clutches, Sheaves, Pulleys, Sprockets.

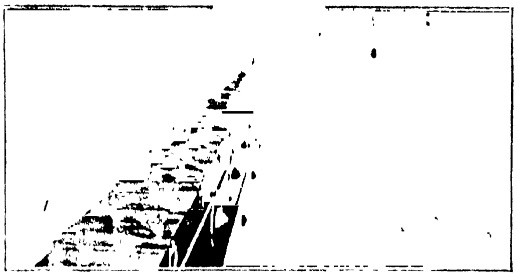
CONVEYORS

Our line of conveyors is very complete and includes every type of material handling equipment of service to the chemical industry. Space does not permit detailed description of our many types, but we can meet every requirement for equipment of this nature.

SCRAPER CONVEYOR HANDLING AMMONIUM SULPHATE

PERKINS PIVOTED BUCKET CARRIER

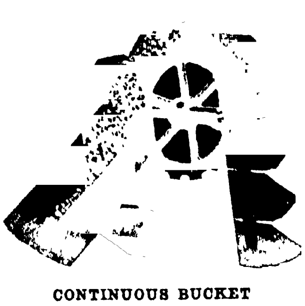
For handling materials under almost all conditions, on either vertical or horizontal runs. Patented roller lip prevents spillage.



PERKINS CARRIER HANDLING HOT CLINKERS

ELEVATORS

Continuous bucket elevators for handling heavy materials, on either vertical or inclined lift. Each bucket, after emptying, forms a chute for the material from the following bucket. Chain may be either a single strand of combination chain or two strands chain. Bucket elevators of steel bushed roller are designed to meet local conditions.



CONTINUOUS BUCKET ELEVATOR

BELT CONVEYORS

For other than short distances, the belt conveyor is the type in general use. It is simple and efficient, carrying material in bulk or in packages.

WEBSTER BELT CONVEYOR

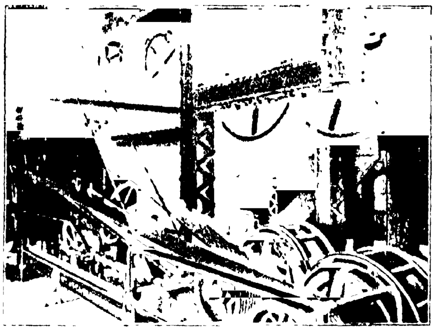
CHAIN

Tested chain for specially severe service; for light drives at ordinary speeds; for apron conveyors; for centrifugal discharge type elevators; for every type of service required by the chemical industry. Detachable link belting is interchangeable with all standard makes of corresponding size. It is suitable for all types of chain elevators.

DETACHABLE LINK BELTING

TRANSMISSION MACHINERY

Steel plate friction clutch for use as a cut-off coupling for shafts, or as a drive for sheaves, pulleys, sprockets, gears and quills. Friction clutch pulleys; cast iron pulleys; flanged pulleys; steel split pulleys; wood split pulleys; step cone pulleys; rope sheaves; turned iron sheaves.



ROPE TRANSMISSION

SPROCKETS

All sizes and shapes, with any number and pitch of teeth; solid or split; key-seated or set-screw. Webster sprockets are carefully tested with their respective chain before shipment. Chilled rim sprockets have smooth hard surfaces, with deep chills which make them especially adapted for severe service. Where great strength is required Webster sprockets can be made of cast steel. We can meet any requirement.

OUR HOUSE ORGAN, "WEBSTER METHOD," SENT TO THOSE WHO CAN USE IT.

WELLER MANUFACTURING CO.

Elevating, Conveying and Power Transmitting Machinery

MAIN OFFICE AND WORKS

1820-1856 NORTH KOSTNER AVE., CHICAGO, ILL.

BRANCHES

New York Boston Baltimore Pittsburgh Salt Lake City San Francisco

PRODUCTS

Coal Crushers, Bucket Elevators, Belt Conveyors, Scraper Conveyors, Apron and Pan Conveyors, Screw Conveyors, Rope Drives, Car Loaders, Car Pullers, Car Unloaders, Power Shovels, Revolving Screens, Shaking Screens, Cement Handling Machinery, Coal Handling Systems, Storage Bins, Automatic Takeups, Bin Gates, Pulleys, Heavy Collar Oiling Bearings, Hangers, Gears, Sprockets, Weller Made Steel Chain.

WELLER EQUIPMENT

Weller Made equipment is designed, built and sold to do the work it is intended for at a minimum expense for operation and maintenance.

We devise correct Elevating, Conveying and Power Transmitting Machinery to handle any production and gladly offer the service of our engineers to the engineers using catalog, if in any way by advice or suggestion we could be of service to them.

In cement plants, ore grinding, stamp mills, gravel plants, beet sugar factories, also in the large packing plants and terminal elevators Weller Made Machinery is usually specified and preferred.

One of our rigid shop rules is that no piece of machinery shall be shipped out without being set up and tested. Even a small pulley with set screws is tried on a shaft of the proper diameter before going to the shipping department, wherever several parts are to be fitted and keyed, each piece is tagged, labeled or otherwise marked to identify it on the job.

By following the above rule delays and trouble at the time of installing are overcome and the man on the job can depend on each piece fitting properly and giving the service that is required of it.

Write. Let us know the equipment you are interested in. Literature will be sent.

ONE, TWO AND FOUR ROLL CRUSHERS

Operate at slow speeds, crack instead of breaking, the coal thereby producing less fine dust.

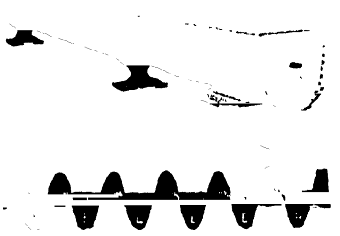
BELT CONVEYORS

With any size belts desired from 10 inches to 60 inches in width to handle any material from fine powder up to large crusher run stone or ore

SHUTTLE TRIPPER FOR BELT CONVEYOR

This tripper carrying a reversible shuttle belt conveyor 12 inches wide, delivers material from 3 to 25 feet on either side of main belt, which is also 12 inches wide

We have built these trippers with a spread of 110 feet, thus eliminating heavy bridges for ore bedding and coal storage plants.



COLD ROLLED SPIRAL CONVEYORS WITH STEEL BOXES

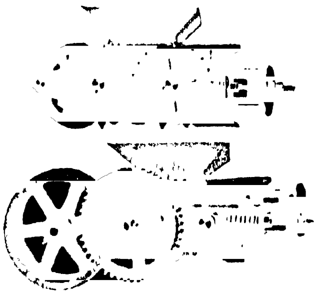
Regularly made from 4 to 30 inches in diameter

SELF CONTAINED APRON CONVEYOR FEEDERS

Especially adapted for fitting to bottom of track hoppers and feeding materials to crushers, elevators or conveyors

In order to secure a uniform flow from the track hopper to the conveyor it is necessary to use a mechanical feeder In this way the flow may be so regulated that the carrier will always operate at its maximum capacity The result may be secured regardless of lump material or the amount of material in the hopper.

HEAVY LINE SHAFT EQUIPMENT AND ROPE DRIVE



COAL CRUSHERS

Simple Heavy Powerful

WELLER MADE STEEL CHAIN

Will last as long and give as good service as any chain made A chain to meet your requirements Write for price list

THIS STAMP ON STEEL CHAIN INSURES SERVICE

WERNER & PFLEIDERER COMPANY

Machinery and Appliances Used in the Chemical,
Pharmaceutical, Food and Allied Industries

SOLE SALES AGENTS

JOSEPH BAKER SONS & PERKINS COMPANY, INC.

27 WEST 43RD STREET, NEW YORK, N. Y.

GENERAL OFFICES
White Plains, N. Y.

FACTORIES
Saginaw, Mich.

PRODUCTS

"Universal" Kneading and Mixing Machines for all purposes; Automatic Sifting, Blending, Conveying and Weighing Plants for Flour, Powdered Sugar, Carbon Flour and materials of similar consistency; Baking and Drying Ovens; Hydraulic and Screw Presses for extrusion of plastic masses, etc.; Rapid Dissolvers for China Clay, Kaolin, Salts, etc.; Rubber Cement, Compounding, Masticating and Washing Machines; Vacuum Mixing Machines; Complete installations for the manufacture of Bread, Biscuit and Wafers, Macaroni, Noodles, Chocolate and Candy, Automatic Traveling Ovens.

"UNIVERSAL" KNEADING AND MIXING MACHINES

"Universal" Kneading and Mixing Machines are built in a large variety of sizes, in a number of types and in different classes of strength. Working capacities range from ¼ gallon up to 2650 gallons.

The unlimited adaptability of "Universal" Kneading and Mixing Machines has brought us into intimate contact with a great variety of different industries, and the experience of long years gained by solving the problems of such industries enables us to determine the particular type and class of machine most suitable for a specific purpose. By giving us complete data and answering the following questions you will help us considerably in quoting or advising you intelligently on the machine suitable for your purpose.

(1) What are the materials to be treated and what is their nature, form, consistency, etc?

(2) What is their specific gravity and what is the weight of the mass per gallon or cubic foot?

(3) How many pounds, gallons or cubic feet of material do you want to treat in one operation?

(4) If cast iron and steel are subject to corrosion on the part of your material, what metals or other materials have in your experience withstood such corrosive action?

(5) Is the mass to be kept at a certain temperature during the mixing process?

(6) Do you use volatile solvents which are to be recovered and do you wish to avoid dusting or the escape of injurious gases or fumes?

EXPERIMENTAL SERVICE

If the materials to be treated are new to us and you desire a test to more fully convince yourself of the entire suitability of our machine to your requirements, arrangements can be made to ship the ingredients to our factory for ample tests.

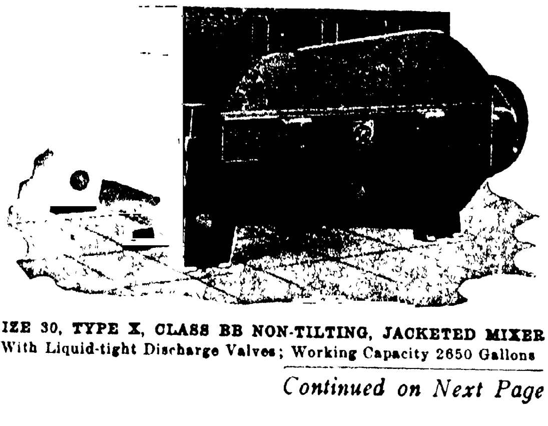
Should you prefer to conduct the experiments at your plant, we are ready to arrange for sending a suitable machine of small capacity, on trial for a reasonable length of time, and on conditions involving a very slight expenditure in any case, and no expense on account of the experiments in the event the machine is retained, or another size or type purchased in its stead.

SIZE 6, TYPE I/II, CLASS BS, LABORATORY SIZE
Working Position

Drive—The Standard Driving Arrangement of our "Universal" Kneading and Mixing Machines, except Type I/II Laboratory Sizes, is our improved three-pulley drive, by means of which the action of the mixing blades can be reversed at will. The reversing action greatly accelerates the kneading and mixing process and facilitates the discharge of the finished mass. Our machines can also be furnished for direct motor drive, if so desired.

Heating and Cooling Arrangement—All "Universal" Kneading and Mixing Machines can be furnished with Heating and Cooling Jackets. On larger sizes heatable mixing blades can be supplied.

Covers—All "Universal" Kneading and Mixing Machines can be provided with covers to suit individual requirements.



SIZE 30, TYPE X, CLASS BB NON-TILTING, JACKETED MIXER
With Liquid-tight Discharge Valves; Working Capacity 2650 Gallons

Continued on Next Page

WELLER MANUFACTURING CO.

Elevating, Conveying and Power Transmitting Machinery

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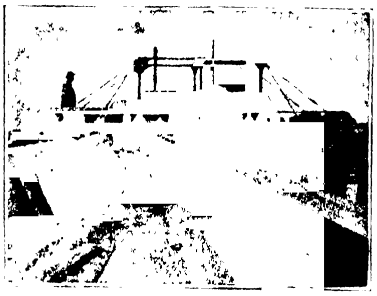
BELT CONVEYORS

With any size belts desired from 10 inches to 60 inches in width to handle any material from fine powder up to large crusher run stone or ore



SHUTTLE TRIPPER FOR BELT CONVEYOR

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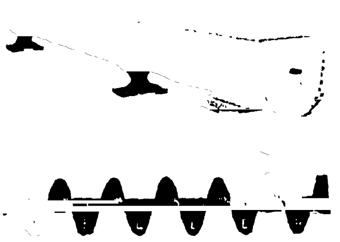

COLD ROLLED SPIRAL CONVEYORS WITH STEEL BOXES

Regularly made from 4 to 30 inches in diameter

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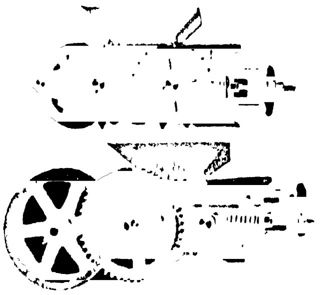
HEAVY LINE SHAFT EQUIPMENT AND ROPE DRIVE



COAL CRUSHERS

Simple Heavy Powerful

WELLER MADE STEEL CHAIN

Will last as long and give as good service as any chain made. A chain to meet your requirements. Write for price list

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MADE
CHICAGO

THIS STAMP ON STEEL CHAIN INSURES SERVICE

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PRODUCTS

The Western Electric Company is prepared to furnish equipment for every electrical need in the chemical industries.

This equipment includes such items as alternating and direct current motors; safety enclosed starting switches; ventilating outfits; intercommunicating telephones; iron-box telephones; flood lamps and wiring supplies of every description.

The name Western Electric guarantees the high quality of each item.

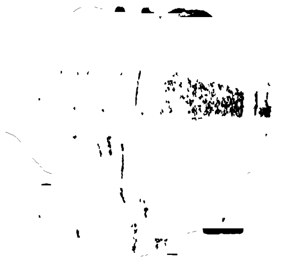
SERVICE

Our 48 well-stocked Distributing Houses in the principal industrial centers of the country are in an exceptional position to render prompt service in shipping electrical equipment. A service staff at each House is prepared to aid in the selection of the proper equipment for any desired purpose We are especially equipped to give emergency service.

MOTORS

For general power service, there are A. C. and D. C. motors of rugged construction to meet any requirement. Windings can be specially treated for conditions prevailing in chemical plants, at slightly additional expense.

The available sizes range from 1/50 H. P. up, horizontal or vertical types. They are especially adapted for service on centrifugals, pumps, compressors and other plant or laboratory equipment.



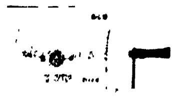
TYPE RC MOTOR

TYPE K
CONSTANT SPEED INDUCTION MOTOR

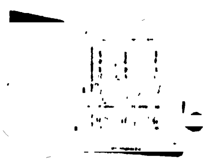
SQUARE "D" SAFETY SWITCHES

The use of these switches is a safeguard for men and machinery against accidents that are common with the obsolete open knife switch.

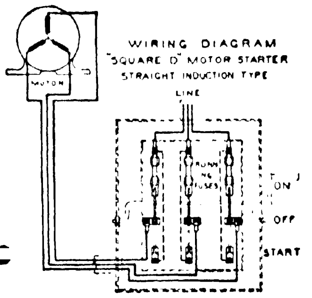
Square "D" Steel Enclosed Motor Starting Switches are designed for use with all types of motors and for electric light circuits.



MOTOR STARTING ENCLOSED SWITCH



MOTOR STARTING SWITCH, DOOR OPEN

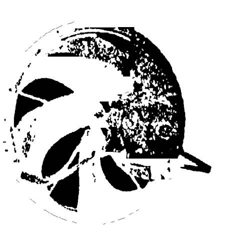


WIRING DIAGRAM, SQUARE "D" MOTOR STARTER, STRAIGHT INDUCTION TYPE

VENTILATING OUTFITS

Western Electric Ventura and Davidson Ventilating Outfits are ideal for exhausting steam, moist air and noxious or odorous fumes and gases. Each outfit is a rugged unit combination of fan, motor and tripod.

The outfits are designed for free intake and delivery. Ventilating outfits for duct work requiring special engineering, can be taken up with our engineers.



WESTERN ELECTRIC-DAVIDSON VENTILATING FAN

WESTERN ELECTRIC VENTURA FAN

Continued on Next Page

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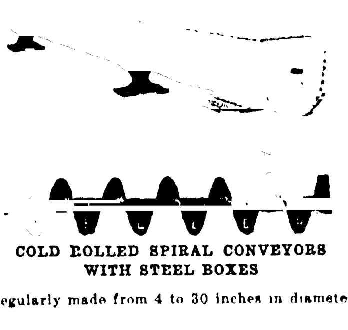

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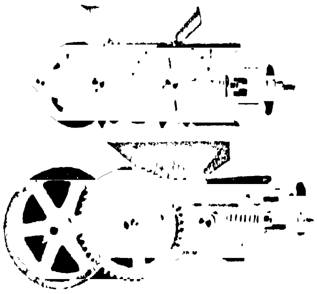

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Brazil (Southern)—Byington & Company, Caixe do Correio P São Paulo 141 Broadway New York U S A

Chile Errazuriz Simpson & Company, Casilla 715 Santiago Chile Spruille Braden, New York, Associate, 141 Broadway New York, U S A

China Gaston Williams & Wigmore Electrical Engineering Corp, Union Building, Bund & Canton Road Shanghai, China 19 Broadway New York U S A

Colombia Vicente B Villa & Company, Medellin, Colombia S A, 165 Broadway, New York, U S A

Costa Rica—H T Purdy, San Jose, Costa Rica

France—Her colonies and dependencies Compagnie Electro Mecanique, 12 Rue Portalis Paris France

Great Britain—Her colonies dependencies and protectorates other than in North America Metropolitan Vickers Electrical Export Company, Ltd, 4 Central Buildings, Westminster, S W I London, England

CUBA OFFICE Royal Bank of Canada Building, Havana

Guatemala Emilio Selle, 10 Calle Oriente Numero 2, Guatemala City Guatemala

Italy—Her colonies and dependencies Tecnomasio Italiano Brown Bovert, 21 Via de Castella Milan, Italy

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Mexico—G Amsinck & Company of Mexico, Inc, 3a de la Palma, No 34, Mexico D F G Amsinck & Company of Mexico, Inc, Edificio Elizondo No 6, Monterrey 90 96 Wall Street, New York, U S A

Norway—Vickers Norsk Aktieselskap, 20 Rosenkrantzgaten, Kristiania

Peru—Emilio Wagner y Cia, Lima, Peru

Philippine Islands—Catton Neill Machinery & Engineering Company, Manila, P I Alexander & Baldwin, Ltd, 82 Wall Street, New York, U S A

Porto Rico—Porto Rico Railway, Light & Power Company, San Juan, Porto Rico 90 West Street New York, U S A

Salvador—Wm C McEntee Santa Ana

PRODUCTS

For descriptive leaflets, application circulars and detailed information regarding Westinghouse products, write our nearest district office.

* Catalogue of Electrical Supplies

Numbers of descriptive leaflets and application circulars will be found listed with various apparatus to which they pertain

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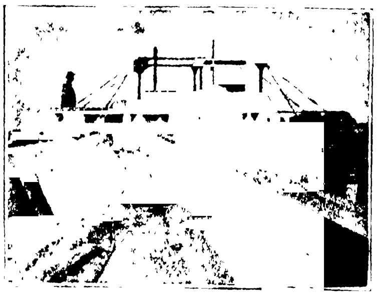

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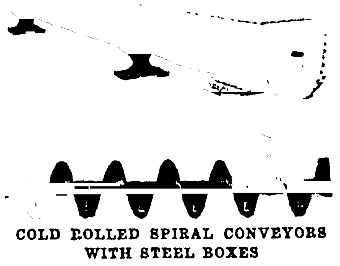

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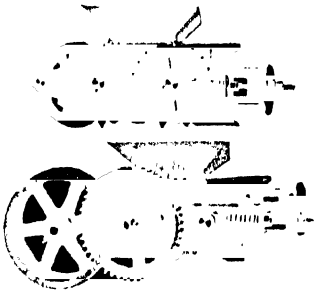

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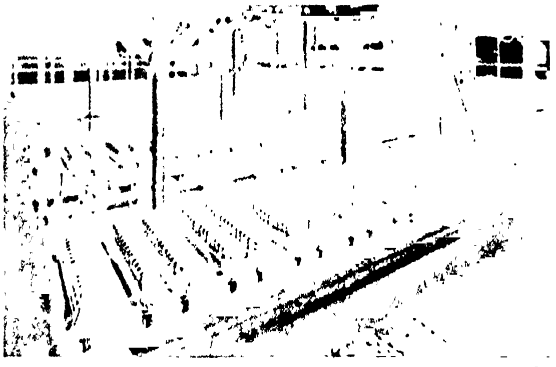
Heavy Acids and Alkalis—In a plant manufacturing on a large scale such substances as sulphuric acid, soda ash, alum, etc., the uses for electrical equipment are many and varied. Among Westinghouse products will be found motors specially adapted to this class of plant. In these motors special precautions have been taken to enable them to stand up against the deteriorating action of acids and other fumes, dust, grit, extremes of temperature and other conditions. These motors (which are fully described on pages 953 to 955) include types suitable for driving conveyors, crushers, rotary furnaces, blowers, pumps, mixers, agitators, etc.



CELL ROOM SHOWING SIX TANKS OF 74 CELLS EACH
U. S. Government Chlorine-Caustic Soda Plant, Edgewood Arsenal, Md.

In the largest alkali plants motors are extensively used for: mixers, agitators, centrifugals, filters, crushers, coke pushers, blowers, gas boosters, cableways, conveyors, cranes, locomotives, coal and ash conveyors, automatic stokers, barrel and drum factories, and brine, by-product, and water pumps.

According to one of the leading sulphuric acid engineers the chief direction in which we may look for an increase in the efficiency of acid plants is in the mechanical handling of materials and for this purpose Westinghouse supplies electrical haulage equipment, as well as special motors suitable for all types of cranes, unloading equipment, and conveyors.

16 H.P. TYPE CS MOTOR (ON LEFT) DIRECT-CONNECTED TO WATER CIRCULATING PUMP, AND 6 H.P. CS MOTOR (ON THE RIGHT) BELTED TO PRE-HEATER PUMP
Plant of Isco Chemical Co., Niagara Falls, N. Y.

Fertilizers and Phosphate Mining--Much of what has been said under the preceding heading will also apply to this important industry, since a large proportion of all sulphuric acid is used in the manufacture of phosphate fertilizers. Further applications of electric power are made in connection with the actual mining of rock phosphate as for driving shovels, grinding machines, crushers, pumps, washers and for furnishing transportation. Comparisons prove that an electrically operated car requiring only one man can do the work of from four to eight men, depending on local conditions.

By-Product Coke Industry—A by-product coke plant may be considered as being divided into four sections in which the operating conditions and electrical apparatus required differ materially. These sections are (1) Coal handling, (2) Coke-ovens, (3) Coke handling, (4) By-product plant.

When used for coal handling, motors are subjected to dust of an explosive nature, but not especially detrimental to the insulation. The principal motor applications in this service are crushers, hammer mills, and conveyors for which alternating current motors of both squirrel cage and wound-rotor types are suitable. The motors are totally enclosed and the larger ones are designed to receive a supply of clean air, either by means of forced or self-ventilation.

The electrical apparatus of the coke ovens themselves is not subject to so dirty an atmosphere as in the handling of coal and coke, but the service required of the motors and control is quite severe, many of the motors being mounted on moving machinery, such as lorry cars, pushers, and door machines. Other applications consist of reversing machines, gas cocks, clay mixers, clay elevators, and quenching pumps. Due to the load characteristics of the first group of applications most of the motors used are of the direct current type.

In handling coke, motor conditions are similar to those in handling coal, but are more severe. Electric locomotives are used along the ovens for hauling the coke to the quenching station and also for moving the coke cars about the plant.

In the by-product plant, the motor applications are to a large extent for various types of pumps, although there are also mixers, crushers, centrifugals, gas boosters or blowers, and fans. All of these applications (with the exception of the booster) are suitable for the use of alternating current squirrel cage motors. The booster requires the use of a variable speed, direct current motor.

Westinghouse has been in close touch with the by-product coke industry, since its first development in this country, and in this way, has been able to introduce many improvements in the design and application of electrical equipment.

Explosives, Dyestuffs and Synthetic Chemicals—The equipment used for the manufacture of explosives, dyestuffs and synthetic pharmaceutical and other chemicals is very similar in general nature—so much so that a dyestuff plant can almost immediately be converted into an explosive plant, which was one of the reasons why the German Government valued so highly their dyestuff industry.

Motors are used throughout such plants for driving the various machines, such as nitrators, autoclaves, centrifugals, rotary driers, tank agitators, etc. Each machine is usually driven by its own motor, belting and gearing being very objectionable in such plants. The drive is usually chain or direct connected. Here

Continued on Next Page

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In cement plants, ore grinding, stamp mills, gravel plants, beet sugar factories, also in the large packing plants and terminal elevators Weller Made Machinery is usually specified and preferred.

One of our rigid shop rules is that no piece of machinery shall be shipped out without being set up and tested. Even a small pulley with set screws is tried on a shaft of the proper diameter before going to the shipping department, wherever several parts are to be fitted and keyed, each piece is tagged, labeled or otherwise marked to identify it on the job.

By following the above rule delays and trouble at the time of installing are overcome and the man on the job can depend on each piece fitting properly and giving the service that is required of it.

Write. Let us know the equipment you are interested in. Literature will be sent.

ONE, TWO AND FOUR ROLL CRUSHERS

Operate at slow speeds, crack instead of breaking, the coal thereby producing less fine dust.

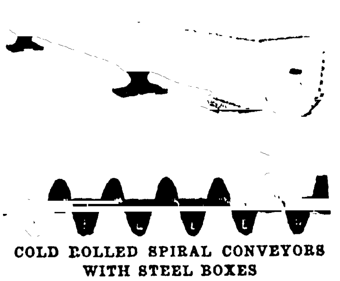
BELT CONVEYORS

With any size belts desired from 10 inches to 60 inches in width to handle any material from fine powder up to large crusher run stone or ore

SHUTTLE TRIPPER FOR BELT CONVEYOR

This tripper carrying a reversible shuttle belt conveyor 12 inches wide, delivers material from 3 to 25 feet on either side of main belt, which is also 12 inches wide

We have built these trippers with a spread of 110 feet, thus eliminating heavy bridges for ore bedding and coal storage plants.



COLD ROLLED SPIRAL CONVEYORS WITH STEEL BOXES

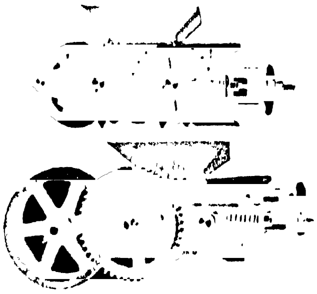
Regularly made from 4 to 30 inches in diameter

SELF CONTAINED APRON CONVEYOR FEEDERS

Especially adapted for fitting to bottom of track hoppers and feeding materials to crushers, elevators or conveyors

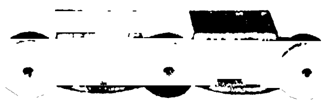
In order to secure a uniform flow from the track hopper to the conveyor it is necessary to use a mechanical feeder In this way the flow may be so regulated that the carrier will always operate at its maximum capacity The result may be secured regardless of lump material or the amount of material in the hopper.

HEAVY LINE SHAFT EQUIPMENT AND ROPE DRIVE



COAL CRUSHERS

Simple Heavy Powerful



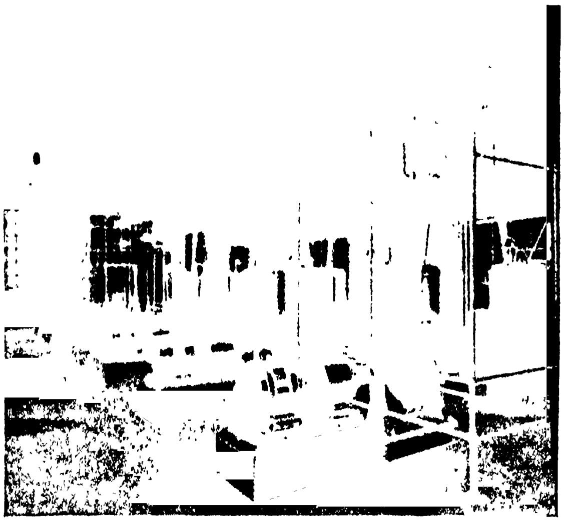
WELLER MADE STEEL CHAIN

Will last as long and give as good service as any chain made A chain to meet your requirements Write for price list

WELLER MADE CHICAGO

THIS STAMP ON STEEL CHAIN INSURES SERVICE

tion involves the following (1) A source of low voltage alternating current, (2) A transformer, (3) A high-voltage rectifier, (4) Means for driving the rectifier, (5) A switchboard and accessories. With the exception of the rectifier all of this equipment is of standard design

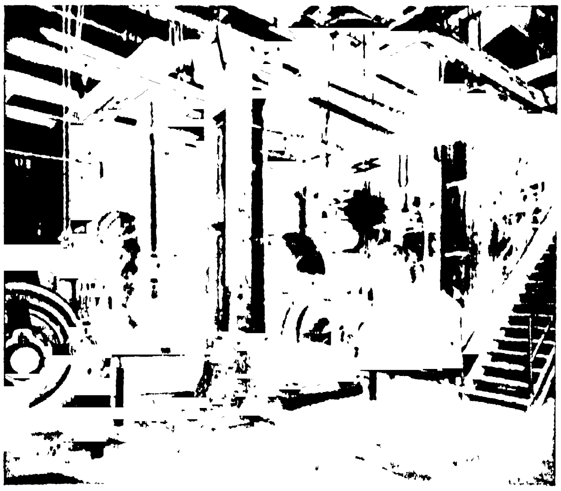


SIX 25KVA 100,000 VOLT ELECTRICAL PRECIPITATION UNITS
St. Joseph Lead Co

There are three different systems of arranging electrical apparatus

Each system has its own field of usefulness but the selection of any one of them requires careful analysis of local conditions, power supply, and arrangement of treaters.

The electrical apparatus for some of the earliest commercial treaters was supplied by Westinghouse, and this company has equipped many of the installations now in operation. Special attention is directed to the fact that this line of Westinghouse equipment, though highly specialized in itself, has been thoroughly standardized, and that standard sizes of generators, transformers, etc., can be obtained—C-7176.



FOUR 700-H.P. TYPE CW MOTORS DRIVING PROCESS PUMPS
United States Government Nitrate Plant No 2, Muscle Shoals, Ala

NITROGEN FIXATION

No matter what process is considered for the fixation of nitrogen, electricity plays an important part. If nitric acid is produced from the air by means of an arc furnace, the power consumption runs into hundreds of thousands of electrical horse-power. If the cyanamid process is employed it involves the use of electric furnaces for heating calcium carbide with nitrogen with which it combines for forming calcium cyanamid, and these furnaces require enormous amounts of power necessitating large installations of generating equipment, transformers and switchboards The crushing machinery, blowers, etc , are electrically driven, as are also the compressors for producing the liquid air and ammonia.

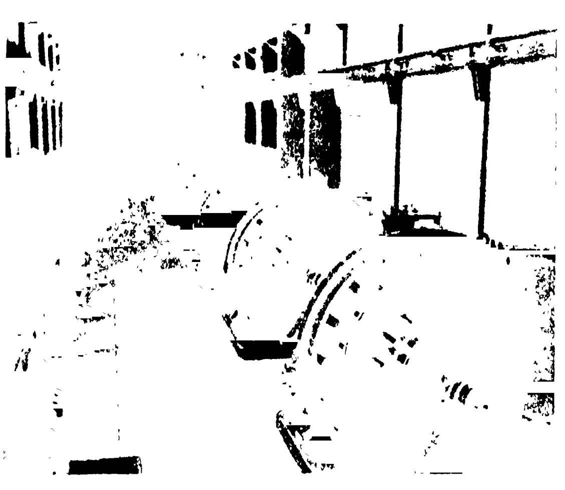
ELECTROLYTIC PROCESSES

Direct current is required in all electrolytic processes, either synchronous rotary converters or motor-generators being used to obtain this form of energy from alternating current supply circuits.

Rotary converters commend themselves for this work on account of their high efficiency. A complete line of commutating-pole rotary converters was developed for this service by Westinghouse They are unequaled for simplicity, ruggedness, compactness, and large capacity within a minimum floor space.

Over one and one-half million kilo-watts of rotary converter capacity under widely varying conditions affords abundant evidence of their success.

As most electrolytic processes require a certain voltage range to maintain a constant current on the cells, synchronous booster type converters are used very extensively The Westinghouse synchronous booster consists of a shunt-wound in combination with an alternating current generator mounted on the same shaft with, and having the same number of poles as, the converter By varying the field excitation of the generator, the voltage impressed on the converter itself can be increased as desired, and the direct current voltage obtained from the converter is thereby varied accordingly



NINE 2500-KW. SYNCHRONOUS BOOSTER CONVERTERS FURNISHING DIRECT-CURRENT FOR THE PRODUCTION OF ALUMINUM

There are 16 Westinghouse rotaries of a similar rating installed in this plant The illustration also shows a portion of the 10,000 ampere and 20,000 ampere Westinghouse carbon circuit breakers for the control of the D C side of the rotaries

BOOSTER CONVERTERS FOR ELECTROLYTIC WORK

Below is given a partial list of standard ratings of Westinghouse synchronous booster rotary converters for electrolytic work. These machines are rated to carry full load current continuously over the entire range of voltage at a temperature rise not to exceed 50° C.

Continued on Next Page

60 CYCLES

Kw	Amperes	Normal Voltage	Voltage Range	Rev per min
500	2000	250	220-280	1200
1000	4000	250	220-280	900
1500	6000	250	220-280	600
2000	8000	250	220-280	400
3500	14000	250	220-280	225

25 CYCLES

Kw	Amperes	Normal Voltage	Voltage Range	Rev per min
500	2000	250	220-280	750
750	3000	250	220-280	750
1250	5000	250	220-280	500
1875	7500	250	220-280	300
2000	8000	250	220-280	250

Where the voltage range is greater than that shown in the table it may be readily secured by providing the transformers with more than one operating voltage tap, and installing the necessary switching equipment to change from one to the other

Motor-Generators — Sometimes motor generators are used in place of rotary converters for converting alternating into direct current for electrolytic work. Westinghouse motor-generators exhibit ability to withstand heavy overloads and their ruggedness, economy and reliability have proved highly successful when rotary converters are not used

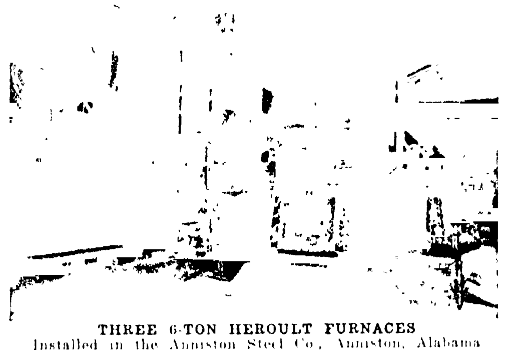
ELECTROMETALLURGICAL INDUSTRIES

Electric Steel—During the last ten years the electric furnace has been used increasingly in the steel industry, principally in refining alloy steels. Recently its use has been extended to refining common steel, malleable iron, etc The modern electric furnace differs greatly from older types, operating costs have been lowered by larger sizes, improved devices for charging and tilting, larger electrodes and automatic regulation

Steel refining furnaces are now built in sizes from ½ to 30 tons. The 1 to 10 ton sizes are common In the following table are given the sizes of furnace transformers, winch and tilting motors used with the average steel refining furnace of to-day

SIZES OF FURNACE TRANSFORMERS AND MOTORS

Furnace Tons	Transformers Kva	H P of Motors	
		Winch	Tilting
1	500	2	11
2	800	2	11
3	1000	2	15
6	1500	3	25
10	2100	5	35

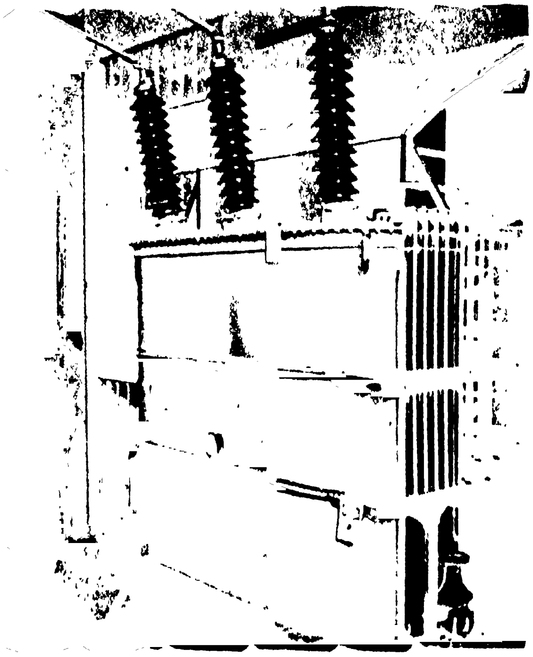


THREE 6-TON HEROULT FURNACES
Installed in the Anniston Steel Co., Anniston, Alabama

Westinghouse is a pioneer in the electric furnace field, and its engineers have not only worked in close cooperation with the furnace manufacturers and users, but have carried on extensive research and development work independently. Such questions as reactance, skin effect, and method of interlacing low voltage bus-bars, have been fully investigated and analyzed, and a large measure of the success of these installations is due to this work.

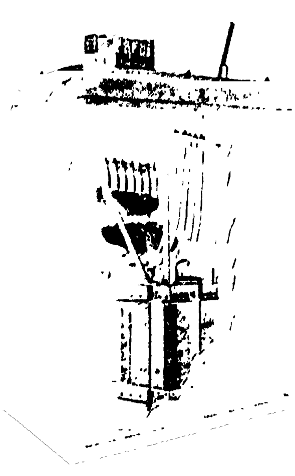
The line of equipment supplied is complete, consisting of furnace transformers for reducing the line voltage to that suitable for the furnace, automatic voltage regulators, tilting and winch motors, automatic electrode regulators and switchboards. Ruggedness, simplicity and dependability are essential and have been incorporated in the apparatus Those parts requiring refinement and precision are accurately designed and carefully constructed. The result is an equipment with the individual pieces of apparatus properly designed for the service they are to perform.

Standard equipment for electric steel melting, ferro-alloy and refining furnaces is described briefly immediately hereafter Westinghouse is also prepared to furnish complete equipment and accessories for brass furnaces



3 PHASE O I W C TRANSFORMER

Furnace Transformers The standard Westinghouse Transformers for furnace operation are of the well known shell type, oil insulated, and are either self-cooled or water-cooled They are compact, rugged, and capable of withstanding the heavy surges and stresses incident to furnace operations Spacing strips between the coils insure thorough distribution of oil and proper cooling, thus eliminating the danger of hot spots Special attention is paid to bracing the coils, both inside and outside the iron circuits, to prevent any distortion of the coils in case of sudden fluctuations in current, or short circuits This is important as a slight distortion may injure the insulation with resultant breakdown and interruption of power supply Transformers for furnace work are designed for normal reactance unless otherwise specified, and all coils are interlaced and the leads brought out through the



3,000 KV A O I S C 11,000-100 VOLT, 3-PHASE, ELECTRIC FURNACE TRANSFORMER

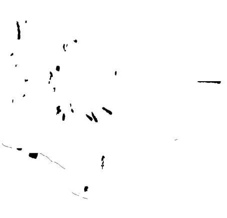
Provided with delta connections at terminals for receiving flexible leads from the furnace

Continued on Next Page

are interlaced in order to reduce the reactance The low tension side is provided with heavy copper bus leads which are carried from the coils directly through the cover and arranged for connection to the furnace bus Transformers are supplied for all commercial circuits and frequencies, and for any low voltage required

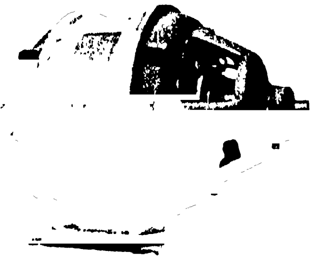
Reactance Usually a furnace installation is arranged so the reactance will be as low as possible in order to get full power into the furnace In some cases, however, additional reactance is necessary to relieve the demand on the power supply system Westinghouse can furnish reactors of either the air cooled or oil immersed type for any amount of reactance

Electrode or Winch Motors All furnaces with movable electrodes require a raising and lowering mechanism Usually a motor driven winch is used Current is supplied to the furnace at constant voltage As the electrodes are consumed, the current would vary if the position of the electrodes with respect to the metal bath were not adjusted For accomplishing this D C motors operating the winch are used, mounted directly on the furnace The standard Westinghouse winch motor is a 230 volt shunt wound type, rated at 55° C for one hour It is totally enclosed to protect the windings from dirt and mechanical injury When the motor is tilted with the furnace proper lubrication is furnished by self lubricating bearings One motor is supplied for each movable electrode If direct current is not available, a small motor generator ranging from 3 to 16 kw may be supplied


TYPE SK TOTALLY ENCLOSED MOTOR

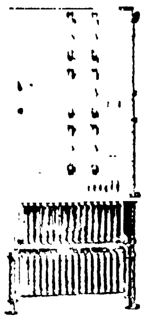
Tilting Motors For tilting the furnace, either A C or D C motors may be used For use with alternating current the standard Westinghouse tilting motor is recommended This motor is ruggedly built, bearings of ample proportions, well lubricated, and protected from dirt, shaft of large diameter, enabling motor to handle the sudden strains when tilting the furnace

A magnetic brake is furnished to secure a quick and accurate stop when tilting The brake can be depended on to hold the furnace at any desired point Should the regular adjustment of the brake shoes be neglected or the power supply suddenly fail, there is no danger of the brake failing to hold the load, as strong compression springs apply the brake shoes and they will not release until the necessary adjustment is made or the power returns, as the case may be The standard type reversing drum controller with suitable resistor is used for operating the tilting motor

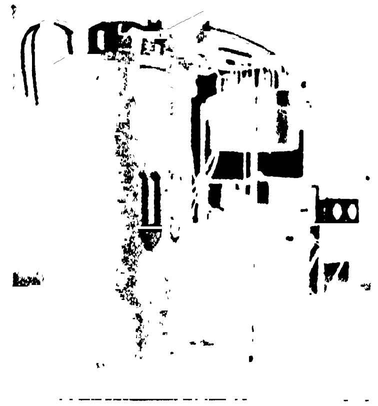

TYPE CI TILTING MOTOR

Where direct current is used for tilting, the standard 230 volt series wound Westinghouse motor is recommended This motor is enclosed, has a high starting torque and combines such special features as compactness, reliability, simplicity and ease of inspection and repair A removable cover over the commutator permits easy access for brush attention A self-contained brake having no exposed moving parts is used It is operated automatically by means of the motor controller

Automatic Regulation — Westinghouse has devised a regulator which will fully meet conditions Realizing the limitations of existing types of regulators actuated by change in current only, the new Westinghouse regulator is designed on an entirely new principle employing both voltage and a current coil. It can be used with any furnace having movable electrodes. The inherent tendency to hunt if it is set to regulate within close limits has been overcome in the Westinghouse regulator, which can be set for close regulation without hunting and at the same time permits the use of a high electrode travel speed


WESTINGHOUSE ARC FURNACE REGULATOR
With Control Element, Contactor, Switches, etc.

ARC FURNACE REGULATOR CONTROL PANEL


WESTINGHOUSE STEP INDUCTION REGULATOR

The control elements, contractor switches, and relays are mounted on a suitable panel, making a compact regulating device It is preferable to mount this panel in the transformer room away from the furnace, while in the furnace room proper is located a panel with ammeters showing the current input to each electrode and the control for the regulator as showing If no instruments are required the small control panel shown is provided

Step Induction Regulator Certain types of furnaces, usually those with stationary electrodes, such as certain resistance furnaces, require a wide voltage range, depending on the process Heavy currents are usual in such furnaces To meet the demands of this service, Westinghouse has devised a step-induction regulator which is furnished in two types (a) the transformer and regulator integral, (b) the transformer and regulator mounted separately

The equipment consists of a furnace transformer, induction regulator, selector, transfer switches and current transformer The voltage is varied by changing the taps on the high-voltage side of the transformer The regulator is motor-operated, and controlled from a push-button station The induction regulator and transfer switches operate automatically together to change connections on the high-voltage side, and to give the proper range on the low-voltage side

Owing to the use of a small induction regulator, the power factor and efficiency of the regulating equipment is exceptionally high An exact setting may be obtained for any voltage desired within range for which the regulator is designed The regulator is very simple and its operation easy, a pushbutton or two-way switch controlling the entire voltage change

COMBINED ARC FURNACE REGULATOR AND CONTROL PANEL

Carbide and Ferro-Alloy Furnaces—The electrical equipment usually required for furnaces making carbides and ferro-alloys is similar in general to that furnished for steel refining furnaces, with the exception that these furnaces are of the stationary type and, therefore, no tilting motors are required.

A simple method of calculating the kilowatt hours required per ton of alloy is to take the figures in the following table which have been compiled from furnaces in actual commercial operations.

Continued on Next Page

DATA

Alloy	Grade Product Percent	Size of Furnace		Number of Phases	Electrode Volts	Percent Recovery	Kilowatt-hrs per lb alloy Trapped
		Tons Chgd	Transfer Kilowatts				
Ferro-uranium	35-50 U	[illegible]	75	1	55-65	75	3.5
Ferro-tungsten	70-75 W	[illegible]	150	1	95	80-90	Smltg 2.1 Rfg 1.7 Total 3.8
Ferro-molybdenum	60-65 Mo 1.5-2 C	1	150	1	65	75-80	77.5*
Ferro-vanadium	30-35 V 3-4 Si	1	150	2	65	75 Avge	3.4
Ferro-silicon	50-70 Si	3-4	1000	1	60-90		2.5-3
Ferro-chromium	60-65 Cr	12-15	750	3	150	70-80	3-4.5
Ferro-manganese	75-85 Mn	15	1200	3	72	70-85	2.2-3.3

*Per lb of Mo in alloy

The limitations on voltage required of the transformers can also be determined from the table. It will be noted this varied with different alloys. The item "Electrode Volts" given in the sixth column is the voltage measured at the electrode terminals that must be supplied to the furnace and is made up of the arc voltage plus a reasonable allowance for drop in the electrodes. To this must be added, in order to obtain the desired low tension transformer voltage, the calculated resistance and reactance drop in the leads from the transformers to the electrode holders. This, of course, will depend upon the distance between transformers and furnaces, upon the size of conductors, upon the amount of interlacing of the leads and upon the skin effect encountered in the conductors. All of these quantities are susceptible of reasonably accurate electrical calculation.

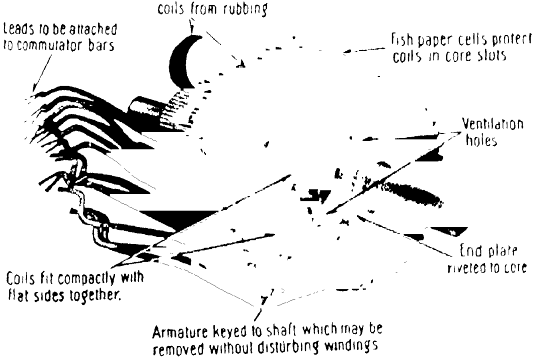
The remainder of the items shown in the table are self-explanatory and present an accurate view of the electrical characteristics required of furnaces and their transformers for melting the more important ferro-alloys.

MOTORS FOR USE IN THE CHEMICAL INDUSTRIES

A motor for service in chemical plants must be provided with an insulation that not only possesses ordinary mechanical strength and heat resisting qualities but that will withstand the deteriorating action of acids and other fumes. Westinghouse has, after careful investigation and trial under actual operating conditions, produced an acid-resisting motor which it has no hesitancy in offering for use in chemical plants.

The insulation immediately adjacent to the copper conductors, designated as the wrapper, is in contact with the source of heat and, therefore, is subject to the highest temperature of the winding. It is also subject to mechanical stresses, and a slight tendency to abrasion, due to its being next to the metal. Because of the tendency of the acid fumes to carry particles into the coil interior and accelerate the disintegrating action, it is essential that the wrapper be of the very best insulating material, possessing all the qualities mentioned above.

In the Westinghouse motors, the wrapper is built of fishpaper and mica, a combination that affords the required strength, toughness, heat resistance, and insulation.


Treated duck strips protect coils from rubbing
Leads to be attached to commutator bars
Fish paper cells protect coils in core slots
Ventilation holes
End plate riveted to core
Coils fit compactly with flat sides together.
Armature keyed to shaft which may be removed without disturbing windings

TREATED COILS USED IN MOTORS FOR ELECTRO-CHEMICAL SERVICE

The individual wound coils are first subjected to vacuum, and then impregnated, which fills all the air spaces between the conductors, and results in a solidly bound coil cemented together both inside and on the surface which effectively seals up the coil and renders it impervious to the action of acid and alkaline fumes.

In any laminated core construction, such as is used with motors, it is impossible to cut a slot which will not present some small projections and irregularities which naturally have a tendency to cut the material which is placed in the slot. To overcome this, Westinghouse uses a tough heavy treated fishpaper which shields the varnish on the completed coil and prevents its surface being cut and scored.

After the individual coils have been assembled in the slots, the entire winding is again subjected to a process of impregnation and drying. The stator with its winding is dipped into a special insulating and acid-resisting compound, removed and baked.

This process is repeated several times and results in a completely saturated coil assembly with a hard and a uniformly smooth surface.

Protection Against Dust and Dirt—Motors operating in many industries, such as coal crushing, cement, potash, fertilizer and similar plants, become covered with dust and dirt which gets into the bearings and oil reservoirs. For such motors special protection is provided by means of felt lined covers securely held in place.

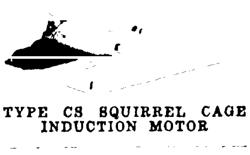
Conduit Wiring—Most plants employing chemical processes use conduit for carrying the wiring through the different buildings. Standard Westinghouse motors can be furnished equipped with a conduit box as shown in the accompanying illustration. All connections between the motor leads and the wiring are easily made inside the box, after which the cover is fastened on by means of screws. Standard pipe threads are used and the box can be turned at any angle.

Enclosing Covers—For certain applications where the fumes are particularly injurious, or for outdoor service, Westinghouse Motors can be furnished with enclosing covers which effectively enclose the openings in the panel of the motor. The bearings of all enclosed motors are dust-proof. Special provision is made for the cooling of these totally enclosed motors.

ALTERNATING CURRENT MOTORS

For the majority of purposes in chemical, electrochemical, and metallurgical plants, A. C. motors are employed, although there are numerous instances where D. C. motors can be used to good advantage, as will be explained later.

Type CS Squirrel Cage Induction Motors—These motors are particularly adapted to the severe conditions met with in chemical industries since they permit continuous operation, regardless of dust and fumes. They are very simple in construction, consisting primarily of a set of wire windings, rotating part, or rotor, and two bearings. There is no complication of small parts and no sliding



TYPE CS SQUIRREL CAGE INDUCTION MOTOR

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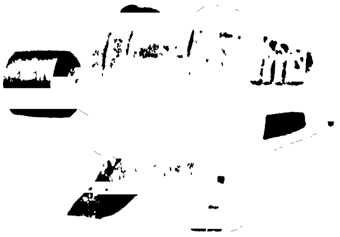
electrical contacts. Furthermore, the bearings are dust-proof and automatically oiled and the design of the motors is such that an accumulation of dust does not interfere with the ventilation The windings are thoroughly impregnated and rendered impervious to oil, moisture, dust and acid or alkaline fumes, as previously explained The great mechanical strength of these motors enables them to withstand the severe shocks and stresses of constantly driving machinery. Their efficiency is excellent, not only at full load but at fractional and overloads as well Current consumption with their use is at a minimum These motors can be supplied in all sizes from 2 to 650 hp ; 2 and 3 phase, 25 and 60 cycles, and for all commercial voltages These motors can also be supplied with vertical shaft , back gears, and in other special forms

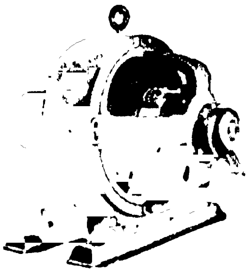

TYPE CW WOUND ROTOR INDUCTION MOTOR

Type CW Wound-Rotor Induction Motor This motor is suitable for constant and variable speed, continuous duty service, when there is required an A C. motor capable of yielding a strong starting effort, for instance, in driving air compressors, plunger pumps, positive pressure blowers, conveyors that are required to start under heavy load, centrifugals, hoists, etc For varying speed service a controller with resistors is furnished to obtain continuous operation on any running point from one-half to full speed These motors can be supplied in any size and for all commercial voltages and frequencies Either the constant speed or variable speed type can be adapted for belting, gearing, chain drive or direct connection

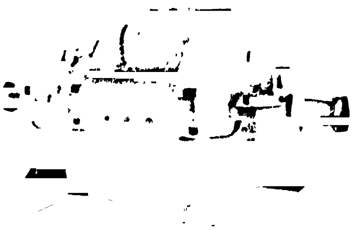
Type CI Wound-Rotor Induction Motor This motor is designed to meet the same requirements as the type CW motor except that it is intended for intermittent instead of continuous service It is especially useful for cranes, hoists, elevators, certain types of conveyors which have to be started under heavy load, and, in general, on all machines where the duty consists of successive periods of operation, each requiring a strong starting effort These motors can be supplied in any required size for all commercial voltages and frequencies.

DIRECT CURRENT MOTORS

There are a number of applications in industrial chemical plants where D C motors are preferable. Typical of these are cases where a wide range of speed adjustment is demanded, as in driving certain types of cranes, hoists, coke charging machines, reels, and coating and finishing machinery in paper and textile plants, paper machine drive, etc Direct current motors are sometimes preferred in plants where the motor driven equipment is not extensive and where direct current has to be generated for other reasons.


TYPE SK DIRECT CURRENT MOTOR

Type SK Direct Current Motor—This motor is suitable for either constant or varying speed and finds extensive application for all kinds of machinery. It can be supplied in sizes from 1½ to 250 hp. and for 115; 230 and 550 volts It can also be supplied as a vertical motor. Like all other Westinghouse motors, it can be had when desired with specially impregnated windings for chemical plant service and also with totally enclosed frame In addition to being mechanically suited for driving heavy material handling equipment it is designed to resist the action of grit, dust and fumes and is thus ideal for chemical plants, coke ovens, smelters, etc


TYPE MCO MILL AND CRANE MOTOR

Types MC and MCO Mill and Crane Direct Current Motors - These motors are suited for intermittent service in which the motor for a considerable portion of the time is accelerating, retarding and standing at rest, and seldom operates for any considerable time at a fixed, continuous load Instances of this are in operating heavy cranes, hoists, etc These motors are of a special and very rugged construction and have massive dust proof frames The insulation is fireproof, the shaft large, and all parts readily accessible These motors can be supplied in sizes from 6 to 300 hp for any commercial circuit At 230 volts. Type MC is totally enclosed, MCO is only partly enclosed. Type MCB is supplied with back geared parts.

Type K Direct Current Motor—This is a series wound totally enclosed motor adapted for heavy intermittent, varying speed service where a severe effort is required, as in driving coke charging machines, cranes, hoists, etc. Hundreds of these motors are in service and their constantly growing use testifies to their excellence. Their special features are compactness, reliability, simplicity, and ease of inspection and repair For use around by-product coke ovens, fertilizer plants, and metallurgical plants, these motors are ideal, as they possess the necessary mechanical qualities for driving heavy material-handling equipment, and at the same time are designed to withstand the constant grit, dust, and fume-laden atmosphere. The motors can be supplied in any capacity for any commercial circuit.

TYPE HK MOTOR

Type HK Motor—Is a more recent design than the type K. It is an inclosed ventilated type, series wound, equipped with commutating poles. These motors are specially designed for cranes, hoists, lift and swing bridges, transfer tables, etc. Type HF brakes are mounted directly on the motor brackets.

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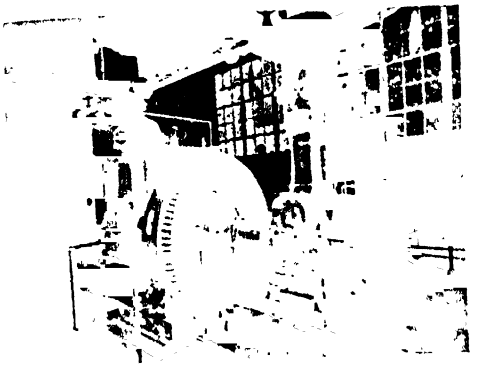
SYNCHRONOUS MOTORS

These motors start as induction motors, auto-starters being used for this purpose, and after reaching full speed the motor runs on its synchronous windings, field excitation being furnished by a small D C. generator, belted to the generator shaft or mounted on it.

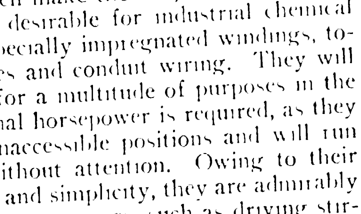


WESTINGHOUSE SELF STARTING SYNCHRONOUS MOTOR
Direct Connected to Compressor

Type G Synchronous Motor—This motor forms a desirable means of driving pumps, fans, compressors and other constant speed equipment, because, in addition to driving the equipment, the motor can be so arranged as to raise the power factor of the circuit on which it is operating, which increases the capacity of transformers and transmission lines, gives better voltage regulation and, therefore, lower rates for purchased power. It also increases the efficiency of other motors on the same line. This motor should not be used where the starting conditions are severe, but rather for centrifugal pumps, reciprocating pumps with by-passes, transformers, with unloading devices, etc This motor can be supplied in all sizes from 30 to 375 h. p. and for all unusual voltages and frequencies

SMALL MOTORS

There is a complete line of Westinghouse fractional horsepower motors in sizes from 1/20 up to 2 h. p. These motors can be supplied in the small general types as the larger motors, thus making, with the various types of motors previously described, complete line of sizes. These small motors can be supplied with all the special features which make the larger Westinghouse motors particularly desirable for industrial chemical purposes, such as specially impregnated windings, totally enclosed frames and conduit wiring. They will be found excellent for a multitude of purposes in the plant where fractional horsepower is required, as they can be located in inaccessible positions and will run for long periods without attention. Owing to their cleanness, quietness and simplicity, they are admirably adapted for laboratory purposes, such as driving stirrers, small mixers, mills, buffing machines, shaking machines, etc.



TYPE CAH MOTOR

STARTING SWITCHES AND MOTOR CONTROL

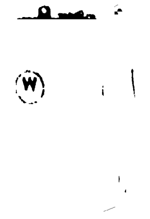
For each type of Westinghouse motor there is a suitable form of starting and control equipment. Many of these are particularly adapted to the needs of the chemical industries on account of the precautions taken to eliminate fire and explosion risk They are also designed so no essential parts are exposed to corrosion.

Type 815 and 816 Quick-Make and Quick-Break Starting Switches For use with A C squirrel cage induction motors 1 to 25 h p, 110 to 550 volts specially valuable in plants where inflammable dust, gases or explosive material are present, since they furnish complete protection to both workmen and machinery and eliminate the use of fuses with the consequent danger and loss of time in replacing them The fire hazard is reduced by the use of asbestos barriers, which permit the elimination of oil when explosive gases are present and explosion hazard outweighs fire hazard, contacts can be immersed in oil These switches may also be used as line switches for wound rotor induction motors Furnished with or without overload and low voltage release

TYPE 815 STARTING SWITCH

Type T-2 Starter A starter of the oil immersed drum type for induction motors of from 1 to 3 h p reversing or non reversing

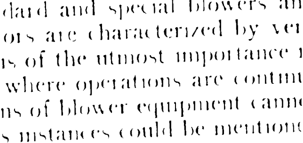
Type A Auto-Starters— A handy self contained starting device consisting of an oil immersed switch, auto transformer, low voltage protective device and overload relay, all mounted in a steel enclosing case The starter handle has three positions start, off and run, each being plainly marked on the starter case, the handle will not remain in the start position unless held This is a fire proof, explosion-proof, corrosion-proof and fool proof starter, especially suited for use where motors are operated by unskilled labor. Adaptable to any A C squirrel case induction motor



TYPE A AUTO STARTER

Type DM Rheostats Designed for use in chemical plants, mines, etc, where dampness and corrosion are present Current carrying parts thoroughly protected against acid and moisture Of strong, compact, fire-proof construction These can be used for any D C motor and for all other purposes where a reliable fire proof corrosion proof rheostat or controller is needed Where the corrosion-proof feature is not important specify type D instead of type DM

Automatic Starters, Type C and Type F Automatic Starters are used for all A C and D C motor applications where the advantages of remote control and automatic starting and stopping are desirable A complete line of the starters is available



TYPE C AUTOMATIC STARTER

BLOWERS AND FANS

Certain types of Westinghouse motors have been designed for driving standard and special blowers and exhausters These motors are characterized by very great reliability. This is of the utmost importance in the chemical industries where operations are continuous and where shutdowns of blower equipment cannot be tolerated. Numerous instances could be mentioned where Westinghouse motors driving blowers have run continuously for long periods of years without any attention other than lubrication These advantages are so generally recognized that Westinghouse motors have been adapted as standard by some of the principal builders of blower equipment.

Continued on Next Page

Westinghouse-Ventura Exhaust Fans—These fans provide a most efficient means of removing moisture, fumes, and odors from work rooms and buildings, in which chemical processes are being carried on They are extensively used for removing the moisture from buildings in which drying operations are being carried on, as in paper mills, or where there is constant moisture from large open tanks containing heated liquids. Best adapted to service where the air is drawn directly from the room to be ventilated and is exhausted into the open or where the inlet and exhaust pipes are so large in diameter and so short in length they offer very little resistance to the passage of the air, as in cases where the air is led through long pipes, or pipes of small diameter. For such service other Westinghouse fan and exhausters can be supplied.

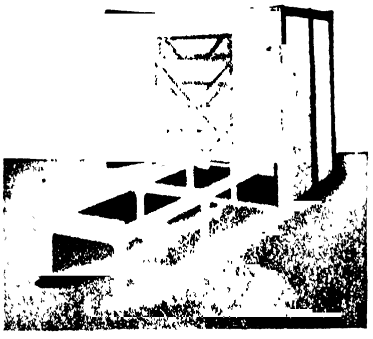
These fans are quiet running, very efficient, simple to control and can be operated from an ordinary lighting circuit, no starting device being required other than a simple snap or knife switch

The motors, which can be either D. C. or A. C are designed for this service, being totally enclosed so as to be protected from dust, dirt and moisture, and when necessary being specially impregnated so as to resist acid and alkali fumes In addition to their use in plant operations, these fans are ideal equipment for ventilating laboratories, offices, factory, dining rooms, etc.

WESTINGHOUSE-VENTURA FAN

INDUSTRIAL HEATING

The principal arguments for the use of electricity as a heating agent in industrial chemical plants are: Freedom from risk of fire and explosion; Cleanliness; Ability to regulate closely, and adaptability to automatic regulation; Reliability; Increased production and economy. The best evidence that the advantages claimed for electricity in industrial heating are actual, is the constant increase in the number and variety of electrically heated ovens, dryers, and other equipment used. Westinghouse industrial heating equipment affords an electrical solution for almost every industrial heating problem.


TYPE N-1 ELECTRIC OVEN

Westinghouse electrically heated ovens may be classified under four general divisions as:

Hand-Operated Kiln or Box Type Ovens—An insulated box, or room, containing the necessary number of heating units, into which the material to be dried, baked or otherwise processed is carried by hand and placed in suitable trays, racks or hooks

Truck-Operated Kiln or Box Type Ovens—Similar to the hand operated oven described above except that the work is loaded on trucks which are wheeled into the oven in which they remain with the material

Semi-continuous Conveyor-Type Oven—Consists of an oven having a door at both ends, with an overhead conveyor running directly through the oven This type of oven is especially suited for enameling and lacquering. The work is hung on the conveyor outside the oven and, after a suitable draining period, the conveyor is started and the work carried into the oven While this batch is being baked, a second batch is being dipped and hung on the conveyor As soon as the first batch is baked the conveyor is started again and the first batch carried out of the oven as the second is carried into it This operation is repeated indefinitely

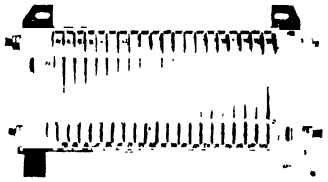
Continuous Conveyor-Type Oven—Similar to the semi-continuous, but operates continuously, the work being hung on a conveyor or chain and moving constantly into, through and out of the oven The speed, the length of the oven and the temperature are so arranged that the process is complete by the time the work passes out To prevent heat losses and fumes an exhaust fan is used.

Efficiency—The efficiency of the above types of ovens expressed in pounds of finished product per kw-hr power consumption (assuming ovens of the latest of each of the respective types, having the highest grade insulation, proper ventilation and intelligent operation) is.

Kiln type, hand-operated. 6 to 8 pounds per kw-hr
Kiln type, truck-operated: 10 to 12 pounds per kw-hr
Semi-continuous conveyor-type. 10 to 12 pounds per kw-hr.
Continuous conveyor-type 25 to 30 pounds per kw-hr

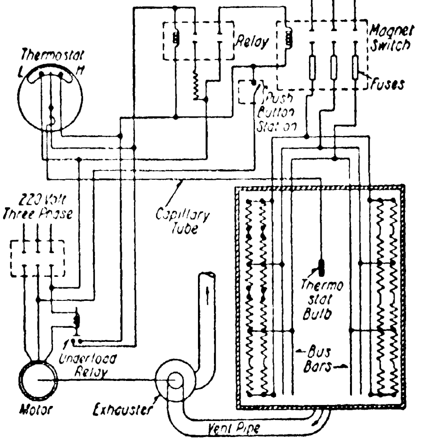
Heating Units—The number of heating units for any given installation will depend on the amount of material being dried or baked, the nature of the material, the maximum temperature required, the time required in which to reach maximum temperature, the system of ventilation and the location of the heaters in the oven Full information covering the above points should be given in making inquiries concerning industrial heating equipment

The heating units are rated at 2 5 kw, at 110-volts, a sufficient number being installed in the oven or dryer to attain the required amount of heat, and units being arranged in series when necessary to take care of higher voltages.


TYPE C HEATER UNIT

The location of the heaters depends on the general design of the oven. For instance when trucks are used the heaters may extend only a definite distance above the floor line, in which case it is sometimes necessary to place heating units elsewhere in order to provide sufficient heat. Generally speaking, the heating units can be located anywhere in the oven that the particular conditions to be met may call for.

The heating element consists of a metallic ribbon wound on a number of fire clay bushings on two steel tie rods, between two pressed steel end plates.



Electrically Heated Oven Automatic Control and Protection

DIAGRAM OF CONNECTIONS
Automatically Controlled and Ventilated Electrically Heated Oven on three-phase, 220-volt Circuit

Continued on Next Page

Great care has been exercised in the design of the heating unit. Sharp bends in the ribbon have been eliminated since it has been found that they have been one of the chief sources of trouble in heating units, owing to the fact that at such points the expansion and contraction of the ribbon causes crystallization and breaking. Connections from unit to unit and to bus-bars are of flat cold rolled steel. Heaters are designed for hanging up on angle or channel iron, strap iron, or pipe without any holes, thus eliminating all drilling of ironwork in the oven and permitting quick and easy installation, re-arrangement and replacement. The ribbon is non oxidizing and has been developed by careful research to give maximum efficiency in heating.

IMMERSION HEATERS FOR INDUSTRIAL USE

Westinghouse type B. Bayonet Immersion Heaters can be used for heating large quantities of water and various liquids other than acids. Also for indirect melting of glue, paraffine, tar, and other viscous substances. These heaters are very useful in the construction of thermostats for experimental and manufacturing processes. A multitude of other applications in the laboratory and plant will immediately suggest themselves.

"SPACE" HEATERS

"Space" heaters are suitable for any application except when an immersion type of heater is required. They are used for heating small ovens and drying rooms where the temperature of the air surrounding the heater is not more than 800° F. (430° C.) and where there is good circulation of air. They are also used for heating press heads and rolls where the heaters are clamped between heavy plates. Owing to the elimination of fire risk, dirt, and soot, they are ideal for such service, and are used extensively in the manufacture of hard rubber goods, insulating material, bakelite products, paper board products and hard fiber products. In the experimental laboratory they are invaluable.

WESTINGHOUSE ELECTRICALLY HEATED HOT TABLES

This form of equipment is a substitute for steam tables in manufacturing operations where substances have to be worked on a flat surface under definite temperature conditions. They permit of more exact temperature control than is possible with a steam table, and frequently produce a considerable saving in raw material, for instance in the manufacture of miscellaneous articles, such as combs from celluloid.

Westinghouse Dry-Type Glue Pots—The dry-type glue pots have been shown by test and practical experience to be designed absolutely correct to give the proper working temperature of the glue without attention. They have a separate glue vessel which can be taken out and cleaned; the glue pot is cheap to operate, costing as much as an ordinary incandescent lamp and can be connected to the lamp socket. Very efficiently constructed and saves an enormous amount of time and reduces wastage of glue to a minimum.

MISCELLANEOUS WESTINGHOUSE HEATING APPLIANCES

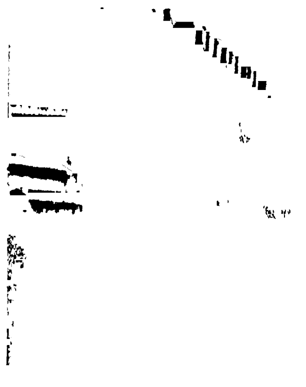
Small heating plates, which are particularly useful for heating inflammable liquids owing to the absence of flame; glue pots; soldering pots; disc immersion heaters; laboratory and domestic hot plates, etc., embody the highest efficiency in design and suggest themselves for numerous uses in laboratories and plants.

AUTOMATIC CONTROL OF INDUSTRIAL HEATING EQUIPMENT

All Westinghouse ovens and other industrial heating equipment can be arranged for automatic control thus entirely eliminating the personal factor in drying, baking and processing operations, insuring uniformity of production and maximum economy in power and materials.

TRANSFORMERS

The special type of Westinghouse transformer required for use in connection with electric furnaces and for the Cottrell process have already been discussed on pages 949 to 952. In addition to these special types there is an extensive and complete line of Westinghouse transformers suitable for all power and distribution purposes, making possible the use of different forms of power by stepping-up the voltage at the source and stepping it down where wanted. These are supplied by Westinghouse in any size or voltage, either single or 3-phase to meet any specific requirements. Three types of cooling are included—self-cooled, water-cooled, and air-blast. On all Westinghouse transformers, the greatest attention is paid to insulation, ventilation and mechanical strength. Westinghouse principles of transformer design have been arrived at through painstaking study, during many years of successful transformer operation, guaranteeing long life and efficient performance, and security against breakdown. Although Westinghouse has built some of the largest transformers ever designed orders for small transformers receive equally careful attention.

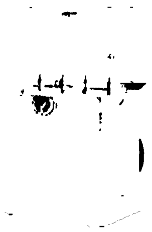


14,000 KV-A., 150,000 VOLT, O. I. W. C. SINGLE PHASE WESTINGHOUSE TRANSFORMERS
For Supplying Current to Synchronous Converters on Electrolytic Work

Distributing Transformers—Capacity from 1 to 200 kv-a. and voltages from 460 to 34,500 volts can be supplied, in pole, platform, or manhole mountings, single or three-phase, so as to take care of every possible operating condition.

Instrument Transformers—Current transformers are manufactured for any value of primary current up to 10,000 amperes, the secondary usually being 5 amperes. For use with any voltage installation up to 75 volts for both indoor and outdoor service.

SWITCHBOARD TYPE KA CURRENT TRANSFORMER



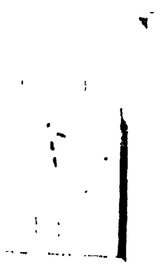
PORTABLE VOLTAGE TRANSFORMERS

Voltage Transformers are also manufactured for both indoor and outdoor service for primary voltage up to 60,000 volts, the secondary voltage being 100 volts. A complete line of the above transformers can be furnished for any standard capacities and ratings.

Continued on Next Page

VOLTAGE REGULATORS

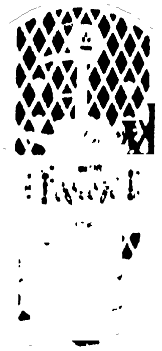
The special type of regulator required in connection with electric furnaces has already been dealt with on page 952. In addition to this Westinghouse supplies a complete line of voltage regulators for indoor or outdoor use, capable of providing a steady normal voltage for any industrial use of electric power. This equipment is supplied in a great variety of capacities and designs so as to take care of all possible operating conditions.



VOLTAGE REGULATOR
With Dust Proof Case

RECTIFIERS

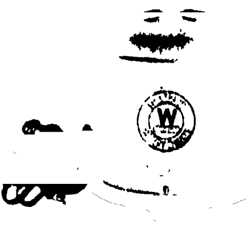
Westinghouse-Cooper Hewitt Mercury Rectifier outfits are manufactured in sizes ranging from 2 to 120 volts D. C. and from 5 to 50 amps. capacity, to be operated from either 110 or 220 volts A. C. 60 cycle source of supply. They are used for changing alternating to direct current. Are easy to install and require little space, and their cost is low compared with other devices used for changing alternating to direct current. They are very simple to operate and, with the exception of the automatic type which has a tilting mechanism, they have no moving parts. The regulation of power is effected by means of an auto-transformer, so that power is not wasted.



WESTINGHOUSE COOPER-HEWITT MERCURY RECTIFIER

RECTIGONS

In addition to mercury arc rectifiers, Westinghouse manufactures a line of rectifiers known as "Rectigons." These are hot cathode rectifiers and use an Argon gas-filled bulb. They will do the same work as the mercury arc rectifiers, but are limited to a 6 amp. 75 volt D. C. capacity. They are manufactured in three sizes, 2½ to 1½ amp., at 6 to 15 volts, 6 to 3 amp. at 6 to 15 volts, and the larger outfits have a capacity up to 6 amp. at from 2 to 75 volts. These battery chargers are very economical and where a small capacity charger is desired, they will prove more satisfactory and are less expensive.



RECTIGON
Which Make Use of the Argon Filled Bulb

Battery Charging Outfits—In addition to the rectifier and rectigons, Westinghouse can supply complete battery charging outfits for charging either lead or Edison cells for use in vehicles, signal and alarm systems, telephones, experimental work, etc.

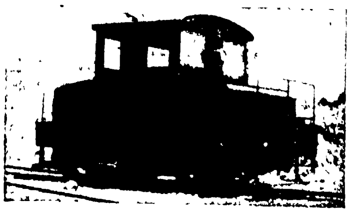
HAULAGE LOCOMOTIVES

Baldwin-Westinghouse Locomotives of the mine type are designed to give continuous service, and therefore, maximum production. The two most important features of these locomotives are the Barsteel frame, and the commutating-pole motors with oil-and-waste lubricated bronze bearings. Other features include accessibility, simplicity, efficiency of operation and general ruggedness of design.

BALDWIN-WESTINGHOUSE BARSTEEL LOCOMOTIVE
For Industrial Use

The storage battery locomotive is particularly adaptable to gathering service and underground haulage, where there are difficulties in erecting and maintaining trolley wire and in bonding the rails, or where wooden rails are used.

For general work wholly on the surface, the addition of a cab or canopy is desirable. Operating under any of the above conditions, it is entirely reliable and very easily handled.

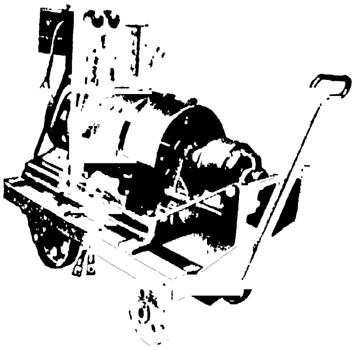


BALDWIN-WESTINGHOUSE BARSTEEL LOCOMOTIVE
With Cab Located at Center

ARC WELDING EQUIPMENT

Owing to the continuous nature of most manufacturing operations in the chemical industry, shutdowns are particularly costly and undesirable. Westinghouse Electric Arc Welding Outfits are an important item in insuring any industrial chemical plant against breakdowns. The equipment can be supplied in either stationary or portable forms. The operation of the process is simple and can easily be learned by an intelligent mechanic. Westinghouse arc welding equipment can be used in making repair arc tanks, kettles, iron and steel parts for securing iron and steel together or for cutting tanks and structional steel, which is frequently necessary in making alterations and repairs to plants.

The portable outfit consists of a motor-generator and control panel mounted on a truck. The generator has a capacity of 175



COMPLETE WESTINGHOUSE A. C. D. C. PORTABLE ARC WELDING UNIT

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amperes. The motor can be either A. C. or D. C. as is required by the power circuit. The control equipment consists of a small panel on which is mounted a field rheostat, voltmeter, ammeter, and 2-pole main switch.

STEAM TURBINE GENERATOR UNITS

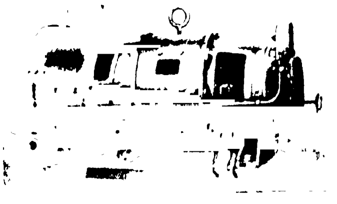
Westinghouse steam turbines of the reaction or Parsons Type or embodying a combination of the impulse and reaction principles, depending upon the particular problem to be met, can be supplied in any capacity for either condensing or non-condensing service

TWO 2500 KW. LOW PRESSURE STEAM TURBINE UNITS

Westinghouse engineers have designed numerous turbine-generator power installations ranging in size from the largest equipment of this class ever constructed down to very small units for the operation of chemical plants. These installations can be so designed as to provide both mechanical power and necessary steam for heat and process requirements under conditions of maximum economy.

SMALL STEAM TURBINES

Small direct current non-condensing turbine generator units are built in capacities from 5 to 15 kw. and provide a very compact lighting outfit for small plants.



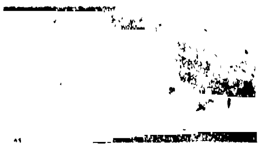
SMALL DIRECT CONNECTED LIGHTING SET

Larger non-condensing turbine generator units built in capacities of 25 to 1,000 kw. are ideal as the main unit in plants where considerable exhaust steam is needed for operating evaporators, stills and other equipment.

Turbines for Driving Machinery—For driving centrifugal pumps, fans, blowers and boiler room auxiliary equipment, a complete line of small turbines is offered which can be arranged either to be direct connected to the apparatus or to be used with reduction gears.

CONDENSING TYPE TURBINE GENERATOR UNIT

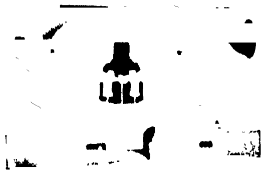
CONDENSERS



UNIT TYPE SURFACE CONDENSER

Westinghouse Leblanc Condensers are offered in three different types—surface condensers, jet condensers, and barometric condensers. Because of their efficient performance these condensers have become generally known as High Vacua Condensers. They cover the entire line of application of condensers to prime movers, the type recommended depending upon the local conditions. They have been manufactured and applied to turbines of all capacities up to 100,000 horsepower. All Westinghouse condensers are equipped with Leblanc air handling equipment.

LARGE SURFACE CONDENSER



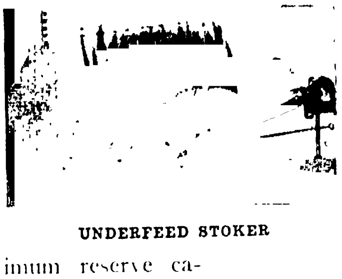
TWIN JET CONDENSER

STOKERS

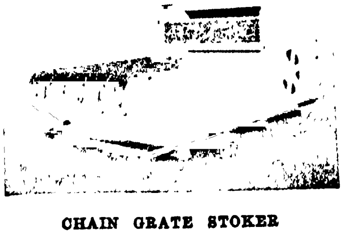
There are three types of Westinghouse stokers, the Roney, the Underfeed and the Chain Grate Stoker. Thus it is not necessary to specify one type for every requirement, as one of these types is always preferable to meet conditions peculiar to each installation.

The Roney stoker is one of the overfeed type and particularly adapted to tubular boilers and for purposes of the moderate sized plant. The Underfeed stoker is of the multiple retort type. This stoker is especially desirable where sudden increases in steam demands must be met as in sulphite pulp and paper mills. Where maximum reserve capacity of 250, 300 or 400 per cent of rating is required, this type of stoker should be used. It requires forced draft which can be obtained from Westinghouse blower installations.

RONEY STOKER



UNDERFEED STOKER



CHAIN GRATE STOKER

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The Chain Grate stoker is of the traveling grate type and gives excellent results where the loads are moderate but should not be used where reserve capacity exceeding 200 per cent of boiler rating is required

WATERWHEEL GENERATORS

The first hydro-electric plant in America was equipped with Westinghouse apparatus and is still in successful operation. Since then Westinghouse engineers have designed many and varied hydro electric installations and the accumulated experience of the Company in this line is at the service of those interested in hydro-electric developments, small or large, in connection with electrochemical plants, pulp and paper mills, smelters, etc Westinghouse is prepared to build W. W. driven Generators of any capacity from 50 to 50,000 kv.-a.

WATERWHEEL GENERATORS AT RUMFORD FALLS, ME

LIGHTNING ARRESTERS

Westinghouse supplies a complete line of lightning protection equipment suitable for protecting all kinds of transmission lines from both atmospheric, lightning and internal surges. This equipment includes many forms of spark gap, electrolytic and horn-type arresters suitable for heavy service.

TYPE AK OUTDOOR ELECTROLYTIC LIGHTNING ARRESTER
At Edgewood Arsenal, Md

Choke Coils—Indoor and outdoor choke coils either with or without oil immersion for all voltages up to 220,000 volts can be supplied to meet every requirement for this type of equipment.

Westinghouse Switchboard Equipment can be obtained to meet any commercial demand that may arise in the control and application of electric current.

For large applications, the facilities of our Engineering Department are available to insure the best design and layout for any installation. For small applications, such as motor generators, a standard line of panels has been developed as listed in our Catalog of Electrical Supplies, 1921-1922. When desired, automatic reclosing carbon circuit breakers can be supplied to insure that circuits do not remain open when over load conditions are met Thus, power can be automatically put back on the circuit soon after these conditions have been overcome. In applications of this nature standard panels, as mentioned, will be found particularly desirable

INSTRUMENTS, ELECTRIC

Switchboard, Indicating—A complete line of switchboard indicating instruments can be furnished for any need For direct current, Westinghouse manufactures ammeters and voltmeters, $2^{9}/_{16}''$, 3″, $4^{3}/_{8}''$, 5″ and 7″ in diameter for all standard commercial ratings. For alternating current circuits there is a line of ammeters, voltmeters, wattmeters, power factor meters, reactive factor meters, frequency meters and synchronoscopes, 7″ in diameter, for any standard commercial ratings. These instruments are rugged, compact and very accurate and will meet all requirements.

Portable, Indicating—Portable instruments for every purpose are available. Westinghouse has two general sizes for direct-current service, one a pocket size and the other a larger size for laboratory and factory testing When used in conjunction with standard portable shunts, the direct-current ammeters can be used for making tests on any standard direct-current circuit For alternating-current service a complete line of instruments are available for measuring amperes, volts, watts, power factors and frequencies These instruments are designed to be used in every class of service and for all standard commercial ratings Each instrument is designed for the highest accuracy consistent with general testing.

Precision—These instruments are used as calibrating standards for watthour meters, switchboards and portable instruments, and for general laboratory work. They possess a high degree of accuracy and are very simple in both their mechanical and electrical construction. They can be furnished as ammeters, voltmeters and wattmeters

Graphic Recording—Two types of graphic instruments are made for recording amperes, volts, watts, power factors and frequencies for any standard commercial capacities and ratings. The first is the **Type M** Graphic, which operates on the relay principle, the measuring element consisting of the well-known Kelvin appliance which operates on an auxiliary circuit by means of contacts. The auxiliary circuit operates a recording pen and a mechanism for driving the paper. The most accurate records obtainable can be had with these instruments.

The second is the **Type U** used where graphic instruments, easily operated, of light weight, and reasonably accurate are required. They are furnished as ammeters and voltmeters for both alternating and direct-current service for any normal operating conditions.

TYPE CO OVERLOAD RELAY

Relays, Protective—A complete line of protective relays used in selective tripping of circuit breakers for modern transmission and distribution systems are available. The necessity for continuity of service, together with the complications of modern trans-

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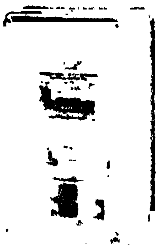
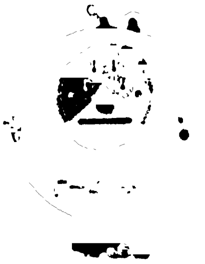


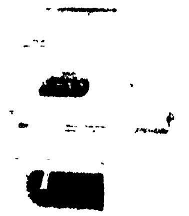
TYPE CR REVERSE POWER RELAY

ssion and distributing systems makes it necessary to consider very fully the question of suitable protective relay equipment. For protecting apparatus such as generators and transformers relays are often found essential. Westinghouse relays operate on the induction principle and their use will prove very beneficial in large operating systems.

Other Meters.—Westinghouse manufactures demand meters and watthour meters for use on any alternating or direct-current circuits. These meters are made in various types to meet every requirement and their use assures the greatest accuracy obtainable for this class of metering work.



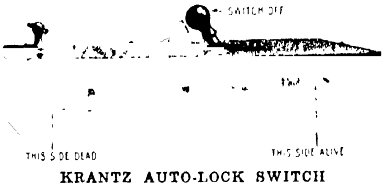
TYPE RO WATTHOUR DEMAND METER



TYPE RA RECORDING DEMAND WATTHOUR METER

KRANTZ AUTO-LOCK SAFETY ENCLOSED SWITCHES

Krantz Auto-Lock switches are particularly desirable in chemical plants or other factories where inexperienced help is employed to operate motors, and where switches must be placed in locations subject to damage from passing trucks or material. These switches are enclosed and are absolutely safe under all conditions. Brush moving contacts are used instead of the knife blade form of contact previously used in switch construction.



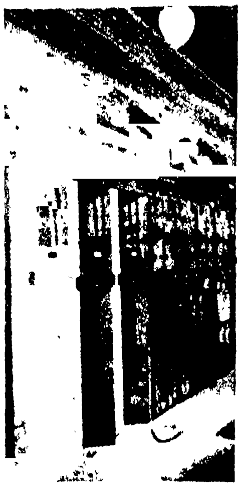
KRANTZ AUTO-LOCK SWITCH

The switch parts are mounted inside of a sheet steel box so that the door over the fuses is automatically locked when the switch is in the closed position.

The door can be opened when the switch contacts are open and held open by a catch, and when in this position, the switch contacts cannot be closed. Also, when the switch is in the open position, the contact brushes completely obstruct the passage between the fuse chamber and the live contact chamber, thus rendering it impossible for a person to reach his hand in far enough to touch the live contacts.

CIRCUIT BREAKERS

Type H oil circuit breakers are small-capacity manually-operated single-throw breakers for indoor dust proof wall mounting, and weather proof, wall or pole mounting for outdoor use. These breakers are particularly adapted for industrial use when there is need for a simple, reliable, and at the same time inexpensive oil circuit-breaker. They are particularly well adapted for controlling motor circuits or other low power-factor circuits requiring the use of an oil type breaker. The distinctive features are: compactness of form; submersion and openings of all contacts under oil, open position maintained by gravity, ability to remove tank without disturbing the operating mechanism, thus greatly facilitating inspection; ample contacts of the butt type which open quickly.



TYPE F 6 OIL CIRCUIT BREAKER

Type F-6 oil circuit breaker is designed especially for starting three-phase squirrel cage induction and self starting synchronous motors up to 720 hp., when used in connection with auto transformers. This breaker protects the motor while running from heavy overloads and short circuits, and when starting protects it from the sudden application of full voltage after it has slowed down, or come to a rest following an interruption of power supply.

INSULATING MATERIAL

Westinghouse research engineers have developed a great variety of insulating materials, which are now manufactured by the company for use in Westinghouse electrical equipment, and for sale for all purposes. These are too numerous and varied to be described in detail here. It is sufficient to state that a suitable insulating material can be supplied for any manufacturing or experimental purpose.

INSULATING OILS

Westinghouse supplies oils for all insulating purposes requiring this class of insulation. Users of electrical equipment requiring oil as an insulation can feel assured that Westinghouse insulating oils are the best obtainable.

BAKELITE MICARTA

This is the name of a remarkable material developed by Westinghouse engineers. While primarily an insulating material, it is also a superior product for many other purposes, and in addition is used in the Westinghouse works in a great variety of applications as well as widely sold to other manufacturers. Chemical engineers will find it advantageous to acquaint themselves with the property of this economic material, which is already being used for insulation of all kinds, water meter discs, pumps, valves, noiseless pinions, etc.

It can be supplied in plates, tubes, or rods. It has high di-electric and mechanical strength, and resists the action of water and most chemicals, including all the ordinary solvents. It has a very low co-efficient of expansion, and a high co-efficient of friction when desired. Not subject to destruction by rodents.

WIRING DEVICES

Westinghouse has developed a very complete line of wiring devices, including everything necessary for any plant or laboratory wiring system, and for connecting all kinds of small electric equipment.

LIGHTING EQUIPMENT

The Westinghouse Lamp Company has made a special study of the lighting of industrial plants and is prepared to offer any advice regarding the design of the lighting system without any expense. The Company furnishes a complete line of incandescent lamps for mill and factory lighting.

WESTON ELECTRICAL INSTRUMENT CO.

115 WESTON AVENUE, NEWARK, N. J.

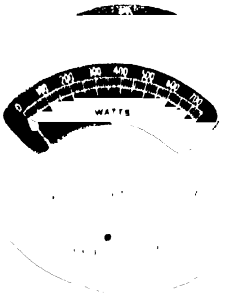
New York
Chicago
Philadelphia
Boston
Cleveland
Detroit
St Louis
San Francisco
Buffalo
Minneapolis
New Orleans
Jacksonville
Rochester
Seattle
Denver
Miami, Fla
Cincinnati
Pittsburgh
Richmond

Toronto
Montreal
Halifax
Winnipeg
Vancouver
Calgary Alta
London Ont
Stockholm
Petrograd
Copenhagen
Christiania
Helsingfors
Johannesburg
Calcutta
Bombay
Melbourne
Sydney
Auckland
Mexico City
Rio de Janeiro
Amsterdam
Brussels
Buenos Aires
Havana
Dutch East Indies
Barcelona
Geneva
Lima

PRODUCTS

Indicating Electrical Measuring Instruments, both Switchboard and Portable, with accessories, for use on A. C. and on D. C. circuits, for every standard or special commercial or scientific purpose.

A. C. SWITCHBOARD INSTRUMENTS



MODEL 343. SINGLE PHASE AND DIRECT CURRENT WATTMETER

This group includes Wattmeters, both Single and Polyphase, Voltmeters, Ammeters, Power Factor Meters, Frequency Meters and Synchroscopes. These Weston Instruments are of the Round Pattern, flat-faced style, with extremely open and legible scales. All except the Synchroscopes are made in two sizes, 9½ and 7½ inches diameter. The Synchroscopes are made only in the larger size. All instruments of one size have an exactly uniform front projection.

These Weston Instruments possess radical advantages over any other form or make of instruments intended for the same purpose. The scales are very open and legible, those of the Wattmeters uniform throughout their entire length and of the Ammeters and Voltmeters practically so throughout their upper two-thirds. The accuracy is guaranteed within 1% of full scale value. See Bulletins 1502 and 1503.

A. C. PORTABLE INSTRUMENTS

Two major groups of Weston Instruments come under this heading:

(1) A group of **Precision** Instruments guaranteed to an accuracy of ¼ of 1% on Alternating or Direct Current Service, comprising Electrodynamometer type Ammeters, Voltmeters, Single and Polyphase Wattmeters and Transformers of unequaled accuracy and serviceability.

MODEL 341 PORTABLE A. C. AND D C VOLTMETER

The feature of equivalent accuracy on Direct or Alternating Current Service is extremely valuable from the standpoint of ease of standardization on Direct Current.

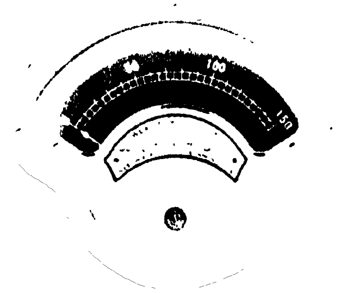
Consult Bulletins 2001-2-3-4.

(2) A group of high-grade general **Testing** Instruments for use on Alternating Current Service only. The accuracy is within ½ of 1% of full scale value. This group includes Voltmeters, Ammeters and Milliammeters. Consult Bulletin 2005.

There are also many other Weston types of models such as Capacity Meters, Potential Transformer Comparators, etc.

D. C. SWITCHBOARD INSTRUMENTS

There is a Weston instrument for every purpose. Each Model is the highest exponent of the instrument maker's art for the class of service and purpose for which it is designed.

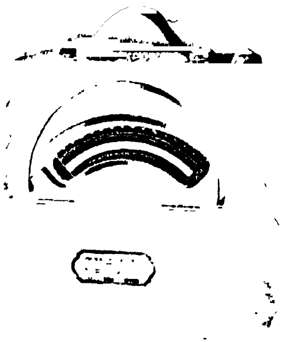


MODEL 267 SWITCHBOARD VOLTMETER
One of the Miniature Precision Group

Most of the standard models are described in Bulletins Nos 20 and 21, but innumerable modifications of standard instruments are made more or less regularly to meet specific needs. If no one of the standard listed types exactly meets your requirements, correspondence is solicited.

D. C. PORTABLE INSTRUMENTS

Weston Portable Instruments are the acknowledged standards for Direct Current Service throughout the world. They include Ammeters, Milliammeters, Microammeters, Voltmeters, Millivoltmeters, Voltammeters, Ohmmeters, Galvanometers, etc., in a variety of sizes, grades and costs to meet every practical requirement.



MODEL 45 (SHIELDED) PORTABLE DIRECT CURRENT VOLTMETER

Laboratory Standard Instruments are also available for either Direct or Alternating Current Service.

Bulletins 501 and 1002 contain detailed information.

EXPERIENCE

In our experience of 33 years we have been called upon to solve so many problems in electrical measurements that we have developed a host of Instruments of special characteristics. Should anyone fail to find in our Bulletins an instrument that will exactly meet his need, we urge that full details of the requirements be submitted to us in correspondence so that we may offer suggestions and recommendations.

WHEELER CONDENSER & ENGINEERING CO.

Complete Condensing, Pumping, and Evaporating Equipment

CARTERET, NEW JERSEY

BRANCHES

New York
Chicago
Boston
Philadelphia
Pittsburgh
St. Louis
Cincinnati
Denver
San Francisco
Charlotte
New Orleans
Atlanta
Salt Lake City
Los Angeles
Seattle
Cleveland
Birmingham
Tucson
London
Shanghai
Tokyo

PRODUCTS

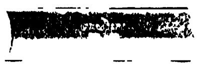
Manufacturers of Lillie vapor-reversing evaporators; Crescent Brand seamless drawn brass and copper tubing and pipe; complete condensing equipment; high vacuum surface, jet and barometric condensers; Wheeler-Edwards air pumps; rotative dry vacuum pumps; turbo-air pumps; steam jet air pumps; centrifugal pumps; cooling towers of wood and steel; feed water heaters; receivers; reheaters; expansion joints; atmospheric relief valves.

BULLETINS

Descriptive bulletins are issued on all our products and will be sent on request.

CRESCENT BRAND SEAMLESS DRAWN TUBING AND PIPE

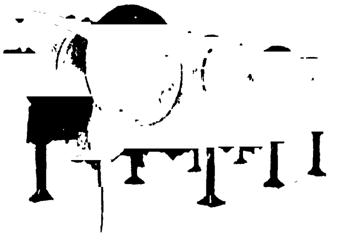
The Wheeler tube mill makes a specialty of tubing and pipe for the chemical industries in copper, brass, Muntz, Admiralty and other non-ferrous alloys; tinned inside or outside or both; all standard sizes and gages, cut to required lengths; pipe sizes threaded when so ordered. Carefully selected materials, the most approved mill methods and an intensive system of inspection and testing are factors which make it possible for us to furnish tubing adapted to the special requirements of any service. No specifications too exacting.



SEAMLESS DRAWN TUBING

EVAPORATORS

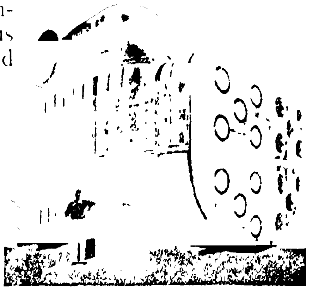
We are exclusive manufacturers of Lillie vapor-reversing evaporators in single and multiple effects They have special features of mechanical circulation, film evaporation, vapor-reversibility; require less space and have higher thermal efficiency than any other evaporators made.



LILLIE VAPOR REVERSING QUADRUPLE EFFECT

HIGH VACUUM SURFACE CONDENSERS

For service in connection with various chemical processes and turbines of any capacity. The compartment type can be cleaned while in service without shutting down the turbine. The auxiliary tube-plate type eliminates trouble from leakage of circulating water into the condensing chamber.



FIFTY THOUSAND SQUARE FOOT SURFACE CONDENSER

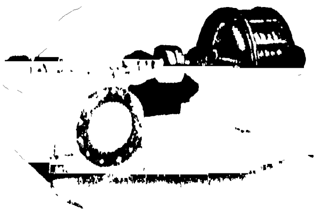
Showed on test 300,000 lb steam condensed per hour, vacuum 29 53" corrected to 30" barometer Equipped with Wheeler Turbo-Air Pump.

WHEELER JET CONDENSERS

Of spray-distribution type of any size for every service to maintain vacua up to 28 and 29 in

CENTRIFUGAL PUMPS

High efficiency double-suction pumps for any service, circulating, hot well and tail pumps for condensers a specialty Built in single stage horizontal and vertical shaft, and multi-rotor types; in all sizes; for any drive, lead, iron or bronze fitted to suit conditions.



WHEELER MOTOR DRIVEN CENTRIFUGAL PUMP

Also made for Turbine or any other drive

WHEELER-EDWARDS AIR PUMPS FOR AIR AND CONDENSATE

Eliminate expense of independent air and hot well pumps. No suction or bucket valves Single, twin or triplex types, any drive

TURBO AIR PUMPS

High speed rotary type for jet or surface condensers, directly connected to turbine or motor Highly efficient and reliable

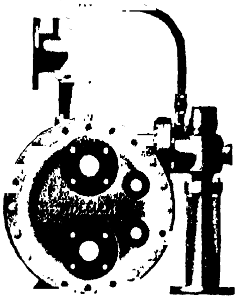
ROTATIVE DRY VACUUM PUMPS

For high vacuum condenser work; maintains a vacuum within 0 5 in. of barometer.

WHEELER TURBO AIR PUMP

STEAM JET AIR PUMP

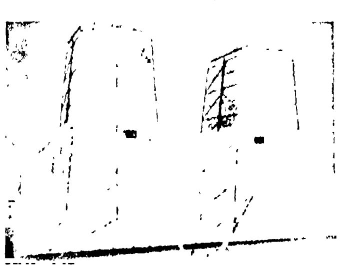
Has exclusive feature of two jets working in series with a condenser between the jets, which enables it to produce higher vacuum with much lower steam consumption than any other type ejector pump made.



WHEELER STEAM JET AIR PUMP, PATENTED

COOLING TOWERS

Cool the water to lowest temperature possible under prevailing conditions, and require less power input per gallon of water cooled than any other tower made. Standardized unit construction permits additions to meet increased needs. Built in all sizes and capacities, of wood or steel, in every draft combination.



WHEELER WOODEN NATURAL DRAFT COOLING TOWER

Capacity 500,000 gal per hour

C. H. WHEELER MANUFACTURING COMPANY

PHILADELPHIA, PA.

BRANCH OFFICES

New York Boston Chicago Pittsburgh Cleveland Charlotte Seattle San Francis

PRODUCTS

Surface, Jet and Barometric Condensers. Radojet Ejector Type Vacuum Pump, Rotrex Rotary Type Vacuum Pump, Mullan Reciprocating Type Vacuum Pump. Rotative Dry Vacuum Type Pump, Single Direct Acting Type Vacuum Pump. Centrifugal Pumps, Natural and Forced Draft Cooling Towers, Vertical Engines. Multiflex Atmospheric Exhaust Relief Valves. Exhaust Gate Valves, Copper Expansion Joints, Dynamometers.

VACUUM EQUIPMENT

We specialize in Vacuum apparatus for all purposes in the chemical industry.

RADOJET VACUUM PUMP

We recommend our Radojet Ejector Type Air Pump which uses steam jets for the removal of air and has the following advantages:

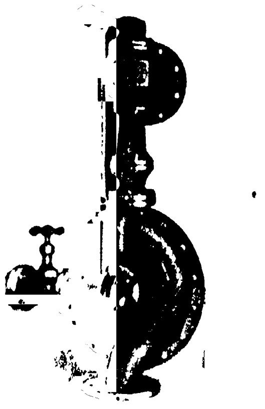
Low steam consumption
Extreme simplicity
Has no moving parts
Requires no lubrication
Requires no foundation
Is noiseless in operation
Does not require inspection, adjustment or priming
Requires minimum space
Is of minimum weight
Starts quickly
Gives continuous service
Requires no attention during operation
Operates with absolute safety

Thermal Efficiency—The Radojet Vacuum Pump has a thermal efficiency of practically 95%. The heat contained in the steam used for compressing the air and vapors is utilized to raise the temperature of the boiler feed water, or process work, the losses due to radiation being practically negligible.

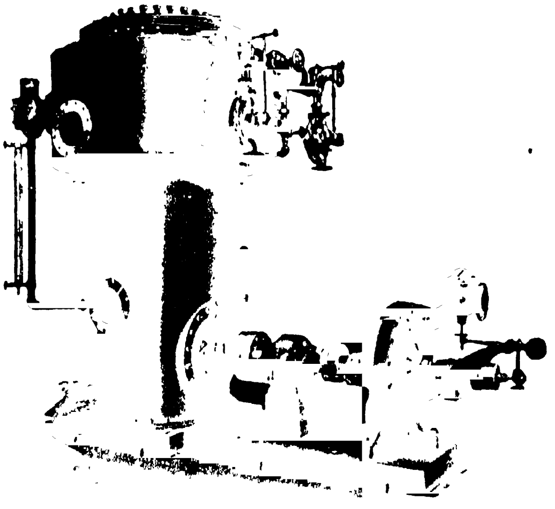
Simplicity—Having no moving parts, the Radojet does not have to be oiled, inspected, adjusted or primed; there is no operating expense. No repairs are necessary.

CONDENSERS

We specialize in the design and construction of condensers and auxiliaries.



RADOJET AIR PUMP



C. H. WHEELER LOW LEVEL JET CONDENSER SHOWING RADOJET EJECTOR AIR PUMPS AND TURBO GEAR DRIVEN REMOVAL PUMPS

SURFACE CONDENSER WITH RADOJET PUMPS AND CENTRIFUGAL CONDENSATE PUMP

WHITE FUEL OIL ENGINEERING CORP.

Mechanical Fuel Oil Burning Systems
742 EAST 12TH STREET, NEW YORK, N. Y.

PRODUCTS

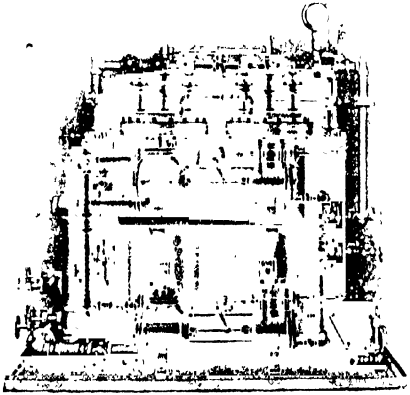
Complete Fuel Oil Burning Systems.

MECHANICAL OIL BURNING SYSTEMS

Our Systems are the result of numerous experiments in the burning of liquid fuel under boilers by means of mechanical atomization in conjunction with a positive supply of pre-heated air, adequate for complete combustion.

In our Systems atomization is secured by forcing heated oil, under moderate pressure, through a specially designed burner. By its mechanical construction alone the burner pulverizes the oil, so that it issues from the burner-tip in the form of a hollow cone-shaped mist completely surrounded by air. This makes unnecessary any wasteful outside atomizing agency such as compressed air or a jet of steam.

In addition to breaking up the oil into a very fine mist it is equally important to supply air in proper proportion to the oil and in such a way that the air and oil are thoroughly mixed.



OIL HEATING PUMPING AND STRAINING OUTFIT

In our Systems these conditions are well met by patent furnace fronts and an extremely simple arrangement of air-regulating cones. The cones govern the supply of air and the spread of the flame so that the flame commences one inch from the burner-tip and does not exceed three feet in length.

The remaining part of the Systems is the heating, pumping and straining unit. This has been designed and connected so that any part can be cleaned, inspected, or repaired while the system continues in operation. The oil from the storage tanks passes through the suction strainers to the pumps. It is then circulated through oil heaters and discharge strainers under moderate pressure to the burners.

Alteration of the average boiler from coal to oil burning is extremely simple.

THE TODD MECHANICAL OIL BURNER AND AIR CONTROL

This construction has been designed to permit an exceptionally large range of adjustment of the air and oil control as well as the elimination of direct radiation. It effects complete diffusion of all air entering the furnace, equalizes the pressure and eliminates currents around and to fires.

The burner tip with the combined atomizer and strainer are assembled as a unit. Their construction prevents improper assembly and they are readily accessible for cleaning or renewal.

TODD OIL BURNER

The complete front is hinged on a ring plate which is bolted to the furnace front. This gives access to the furnace and also the burner assembly which is swung out with the front when it is opened.

The burner connection to oil supply manifold is flexible and will stand pressure of 1000 pounds per square inch. This feature eliminates the dangers of rigid piping and the leaky connections caused by constant making up of joints.

The installation of the front on a boiler or furnace requires no special tools or fittings.

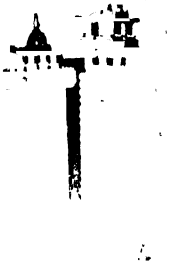
Capacity 100 to 1600 lbs. oil per hour.

The burner is of simple but rigid construction and is designed to atomize the oil, pre-heated to the point of fluidity.

Our burners are obtaining, in every day practise, evaporations of 16 pounds of water from and at 212° F. per pound of oil burned and boiler efficiencies of 80% to 85%, a very marked increase in efficiency over coal.

HEATERS

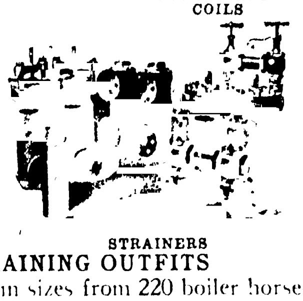
In the burning of fuel oil, the oil is usually heated to temperatures from 150°F. to 300°F. according to the characteristics of the oil used. In the White System the heaters are cylindrical with a header containing stuffing boxes through which the ends of the heating coils pass.



HEATER AND COILS

STRAINERS

The fuel oil delivered from the wells holds in suspension fine particles of sand and dirt. This foreign matter is caught in the strainer baskets provided in the line of flow between the tank and the burner. Usually two duplex sets of strainers are fitted.



STRAINERS

UNITOIL HEATING, PUMPING AND STRAINING OUTFITS

Unit outfits are built in sizes from 220 boiler horse-power to 2,500 boiler horse-power. For a great many power plants these unit outfits are used.

THE WHITLOCK COIL PIPE COMPANY

HARTFORD, CONN.

149 Broadway, New York
527 Commercial Trust Bldg., Philadelphia

50 Congress St., Boston
343 So. Dearborn St., Chicago

OFFICES IN ALL OTHER PRINCIPAL CITIES

PRODUCTS

Manufacturers of Coils and Bends of all kinds of Copper, Brass, Iron and Steel Pipe and Tubing.

Designers and Manufacturers of Special Steam Heaters for the Heating of Water, Oil, Air and Gases or Liquors of every kind; Coolers for the Cooling of Water, Oil, Air, Gases or Liquors. Also Evaporators, Condensers and Distilling Systems for every purpose.

INTRODUCTION

From the very special nature of our product it is impossible to give anything more than a mere outline of its nature and scope. The illustrations in these pages show a few typical styles of coils and a few of the different types of heaters, etc., that we manufacture and the text gives a suggestion of the uses to which they can be applied.

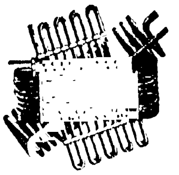


FIG 61

COILS

We are prepared to manufacture practically anything in the line of tube and pipe coils. A few uses to which our coils may be applied are the following:

Transformer cooling coils for conducting the cooling water in oil-cooled transformers.

Acid-warming coils for warming the acid in the manufacture of smokeless powder.

Boiling coils for boiling acid, dyes or liquors of any kind by means of steam.

Cooling coils for cooling acids, oils and other liquors by means of water.

Heating coils for heating air or other gases by steam.

Evaporating coils for use in evaporators or stills as in the manufacture of dyes, etc.

Condensing coils for condensing vapors produced by distillation as in the manufacture of essential oils, etc.

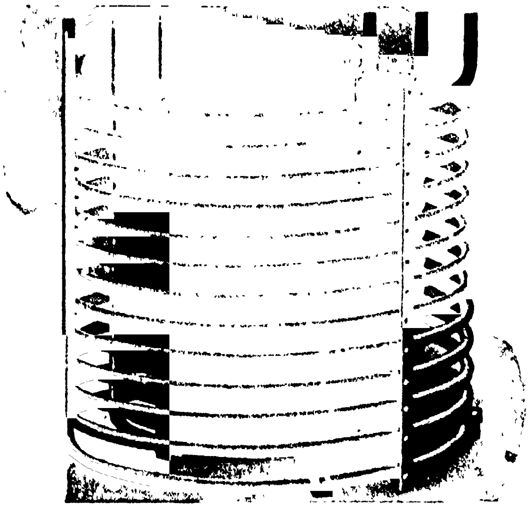


FIG. 60

Coils in general may be divided broadly into the following classes and sub-classes:

1. Helical coils.
   - (a) Plain helical coils
   - (b) Tapered helical coils
   - (c) Double nested helical coils, also triple nested, quadruplicate nested, etc. Fig 60 shows triple nested helical coils.
2. Flat spiral coils
   - (a) Plain flat spiral coils, Fig 218
   - (b) Dished flat spiral coils
   - (c) Multiple deck flat spiral coils, Fig 216
3. Oblong or trombone coils
4. Square or box coils
5. Zigzag coils
   - (a) Plain zigzag coils
   - (b) Collapsed zigzag coils

There are many other special types of coils which it would take too much space to describe or illustrate, but a few samples may be given. For instance, Fig 104 shows a cross-section of the manifold for a double-nested helical coil, with the ends connected to a common manifold.

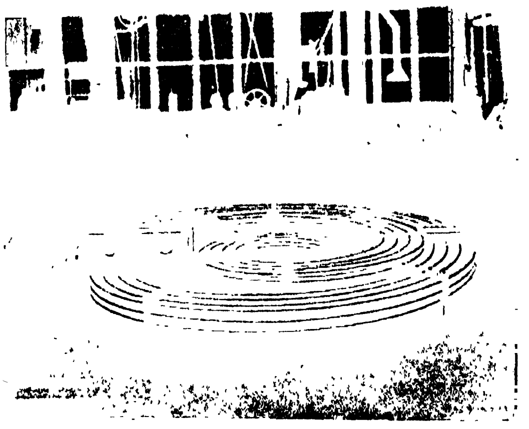


FIG. 216

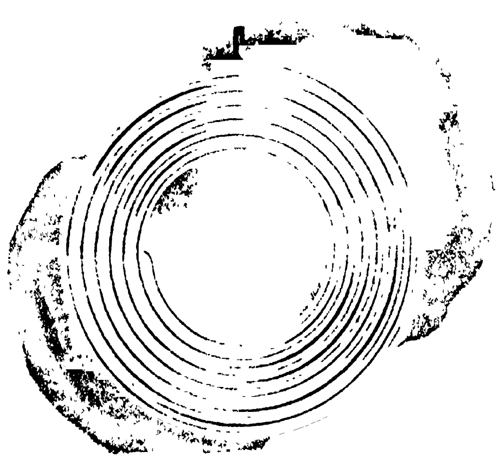


FIG. 218

Continued on Next Page

FIG 104

Fig. 216 shows a special multiple nested helical coil made in two sections, with ends connected into headers and the coils alternately double and triple pitch. This coil was designed to heat the liquor in a large vat, by means of exhaust steam. Note that the outer set of coils had to be broken into two semicircular sections to admit of shipment. This coil gives a fairly good idea of our ability to design and build coils to meet a peculiarly difficult combination of conditions.

We are prepared to submit sketches, specifications, and prices covering coils or bends for any requirements. It is only necessary for you to tell us what you wish to accomplish and we can design and build apparatus to do it.

HEATERS, COOLERS, EVAPORATORS, CONDENSERS, SPECIAL APPARATUS

We manufacture several standard types, in various sizes, of the products coming under this heading as well as designing apparatus to meet specific conditions.

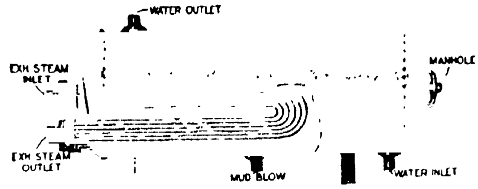


FIG. 14

Storage Types—Where conditions require a reservoir of the liquid to be heated or cooled due to sudden or irregular draughts or irregularities in the supply of the heating or cooling medium, a storage type heater or cooler is used. An example of such a situation is found in the textile mills where a constant supply of exhaust steam is available to heat process water which is intermittently drawn in large quantities. Under such circumstances a storage heater is required to provide thermal storage for the heat available during periods of rest, so that this heat may be used in the hot water during periods of draught. (See Fig. 14.)

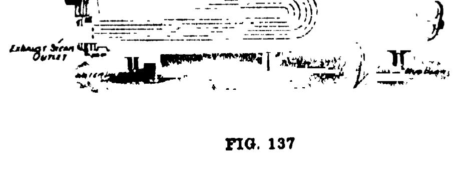


FIG. 137

Sometimes several independent heating or cooling units are used in the same vessels, as in the case of the same textile mill, when at times the exhaust steam supply is insufficient, and an automatically controlled supply of live steam is admitted to an auxiliary heating unit contained within the vessel. (See Fig. 137.)

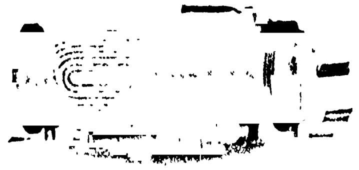


FIG 151

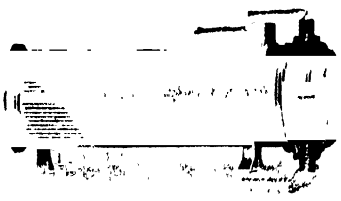
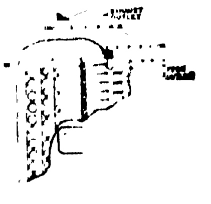


FIG 152

Instantaneous Types — Where the draught on the heater or cooler is steady and the supply of the heating or cooling medium is constant and sufficient, no thermal storage is required and the problem becomes one of effecting a heat transfer from the heating medium, or to the cooling medium, at the highest possible rate. The particular design of heat exchanging device depends upon the exact conditions of service. See Figs. 151 and 152.



Variations of the devices illustrated are used in many special processes. For instance, our Type A and B feed water heaters have been adapted, with certain modifications, to such uses as air cooling to cause precipitation and recovery of valuable vapors. See Fig. 50.

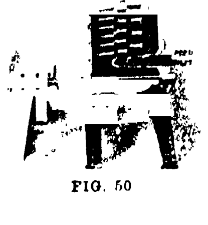


FIG. 50

The adaptation of heat exchanging devices to special heating and cooling processes as well as the selection of a suitable type is always a nice problem in economy. Our excellent facilities for the manufacture of such devices, together with our engineering experience in this necessary selection and adaptation, place us in a position to assist the industries in these problems.

WHITE METAL MANUFACTURING CO.

Manufacturers of

Collapsible Tubes and Sprinkler Tops

HOBOKEN, NEW JERSEY

PRODUCTS

Collapsible Tubes and Sprinkler Tops

COLLAPSIBLE TUBES

Many products that are manufactured today for the retail trade are being sold in types of containers that are unsuited to the product.

Perfectly good products frequently do not reach their maximum consumption, due principally to the lack of a proper container.

Collapsible tubes are finding an ever widening scope of adaptability to the products of chemical manufacturers who are selling to the retail trade.

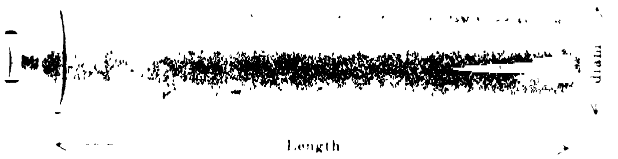
These tubes are made in plain or decorated designs, and of varying soft metal alloys or of pure tin.

These tubes can be fitted with a variety of designs of tops.

Some products that are successfully sold in collapsible tubes are:

Adhesives
Tooth Pastes
Vaselines
Cold Creams
Vanishing Creams

Antiseptics
Shaving Creams
Flavoring Extracts
Rubber Cement
Etc.



TUBE SHOWING MEASURING BASIS

We manufacture all types and varieties of both plain and decorated tubes from ⅜" diameter to 2½" in diameter and from 1½" in length to 14" in length, in proportion to the diameter.

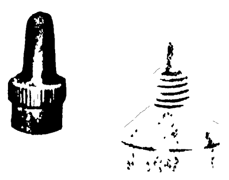
If you have a product the sale of which you feel could be improved upon by having a better type of container, we would be pleased to have you write us and tell us of your problem. The growth of our business and the large number of satisfied customers we have today indicate that the use of the Collapsible Tube as a container has overcome the most troublesome problem in developing the sales of many products sold to the retail trade.

CAPS AND OPENINGS

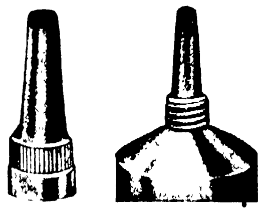
We manufacture all types of caps and openings for the tubes. We will gladly cooperate with prospective customers in making a suitable cap and opening for their tubes. Below are illustrated the openings and caps most commonly used.

RIBBON OPENING, OCTAGON CAP WITH CORK WASHER

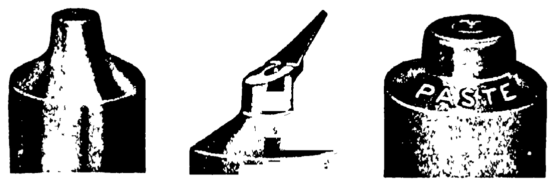
ROUND OPENING, ROUND CAP WITH CORK WASHER



EYE TIP TUBE



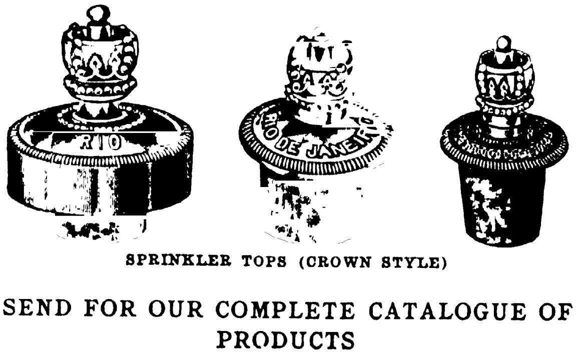
NASAL TUBE



GLUE AND PASTE TUBES

SPRINKLER TOPS

We also manufacture a very comprehensive line of Sprinkler Tops for a variety of designs of glass bottles for perfumes and cosmetics. Some of these designs are illustrated below, and can be had in plain, nickel or gold plated finish. We will be glad to cooperate with prospective customers in the design of special styles.



SPRINKLER TOPS (CROWN STYLE)

SEND FOR OUR COMPLETE CATALOGUE OF PRODUCTS

WILLIAMS PATENT CRUSHER & PULVERIZER CO.

GENERAL OFFICES AND WORKS
ST. LOUIS, MO., U. S. A.

Chicago Office and Showroom
1615 Old Colony Building

San Francisco Office and Showroom
67 Second Street

BRANCH OFFICES

York
delphia

Pittsburgh
Scranton

Detroit
Richmond

Denver
Salt Lake

Los Angeles
Seattle

Montgomery

PRODUCTS

Crushers and Grinders for all Raw Materials; Coal Crushers; Grinders for Bone, Tankage, Shell and Fertilizer; Shredders for Bark, Chips, etc.

DESCRIPTION

These machines are constructed on the hinged (loose) hammer principle. They consist of a substantial housing, a rotor comprising the shaft, discs, hammers, set collars, flywheel, driving pulley; breaker plates, cage or grid, and either ring oiling or ball bearings. The material entering the hopper is first crushed or broken on the breaker plate in the front of machine; it then passes on to the cage or grids where it is reduced to the desired fineness, degree of fineness being regulated by the openings between the bars, or by the perforations when perforated metal is used. In some types, particularly those designed for fine grinding, a hand wheel adjustment is provided for maintaining the distance between breaker plates and hammers the same at all times. Close contact is the secret to fine grinding.

ADAPTABILITY

Whether for crushing, grinding, chipping or shredding; whether you wish to handle soft or hard material, whether a fineness of 100 mesh or a product 2" and under is desired, or a capacity of 100 lbs. or 300 tons per hour, a Williams machine can be found to meet your requirements.

These machines crush coal for stokers, beehive and by-product coke ovens, etc.

They crush limestone in quarries, waste glass for remelting, bone for glue manufacture, etc.

Gypsum, clay, shale and coal can be efficiently ground with Williams machines in cement and gypsum plants.

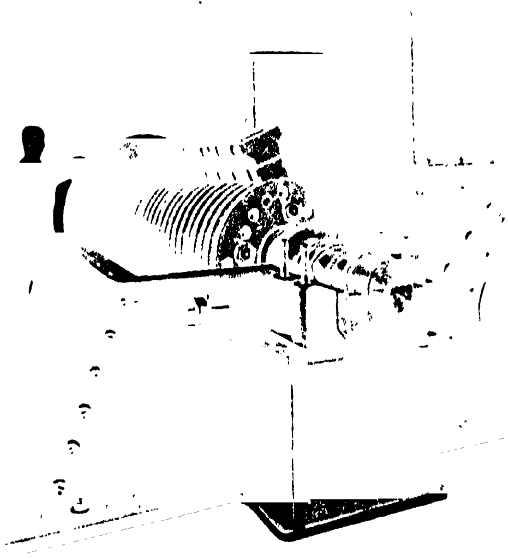
Numerous Williams machines are in use for grinding lime for hydrating or agricultural purposes; chemicals, soap powder, by-products from flour and feed mills, etc.

They shred alfalfa and other hays, Guayule root, pea vine, feathers, bark, roots, chips for tanning or dye extract purposes, old magazines and waste paper, etc., in paper and pulp mills.

If you have any material you wish to reduce from one size to another it can be done in a Williams, if at all.

ADVANTAGES

The advantages of using the Williams hinged hammer crushers, grinders, etc., may be summed up in four words—**Adaptability, Accessibility, Durability** and **Reliability.** They are adapted, as already mentioned, to numerous classes of work, either coarse or fine, large or small capacities. They are easily inspected, parts replaced. It does not require hours of valuable time to open and inspect these machines or to replace parts. They are substantially constructed to withstand the severest strain that may be put on them; foreign material accidentally introduced cannot injure them. In addition they can be depended on; once installed the Williams mills will operate year in and year out, giving the same satisfactory results as the day they were first put in. Williams machines may always be relied upon to help out in time of need.



MACHINE OPEN SHOWING HAMMERS

LITERATURE

Williams Crushers, Grinders, and Shredders are the most versatile machines manufactured and are adaptable to nearly all materials which it is necessary to reduce—over 600 in number. We have subdivided a few of the most important materials into eight divisions, as per tables below. From this you can specify the catalog desired by number.

NO 23	NO 23 A	NO 23 B	NO 23 C
Limestone Lime Gypsum Coal Ochers Dry Colors	Shale Clay Asphalt Sand All Clay Material	Tankage Bone Shells Poultry Food and all Fertilizer Material	Oil Cake Linseed Cotton Seed Castor Niter Salt Cake Soy Bean Copra, etc

NO 23 D	NO 23 E	NO 23 F	NO 23 G
Stock Food Cereals Alfalfa and all By Products from Flour Mills	Coal Crushers for Coke Ovens Gas Plants and all Industrial Plants	Shredders for Bark Chips Wood Pulp Licorice Root and all Fibrous Material	Soap Powder All Drug Material Paper Stock and all Chemicals

WICKWIRE SPENCER STEEL CORPORATION

WORCESTER, MASS. BUFFALO, N. Y.

DISTRICT OFFICES AND WAREHOUSES
Boston Chicago New York Tulsa, Okla Philadelphia San Francisco Detroit

PRODUCTS:

Wire Cloth of any practical metal in a wide variety of meshes, gauges and weaves.

Perforated Metals of every description in a great variety of perforations. Also Perforated Metal Specialties.

Spiral Fabric Conveyor Belt in all lengths, widths and meshes and of any practical metal.

Also: Machine Cast Pig Iron, Steel Billets and Rods, Wire, Springs, Wire Forms, Electrically Welded Fabric for Concrete Reinforcing, Wire Lath, Wire Fencing, Window Screen Cloth, Wire Goods and Specialties.

MANUFACTURING FACILITIES:

In the space here at our disposal it is possible to describe only a few of the many Wire Cloth and Perforated Metal products we are able to supply for industrial chemical purposes.

The first power loom in the world for weaving wire cloth was introduced by us. We have constantly improved the original type and have now an experience of nearly 70 years in the manufacture of our products. We are able to produce fabrics especially adapted to practically every purpose for which they may be required.

We maintain a large corps of expert inspectors to thoroughly examine every roll of wire cloth on machines expressly designed for that purpose, and all defects are cut out whenever discovered.

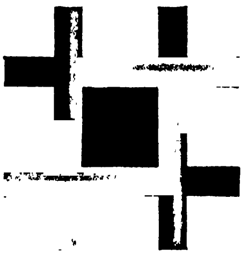
Similar precautions are taken in our Perforated Metal and Spiral Fabric Departments.

METALS IN WHICH WE CAN SUPPLY WIRE CLOTH:

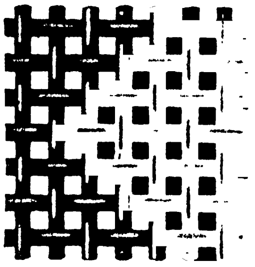
Steel, plain, or—
  (Galvanized)
  (Tinned)
  (Copper Coated)
  (Painted, etc.)

Copper or Brass, plain, or—
  (Tinned, etc.)

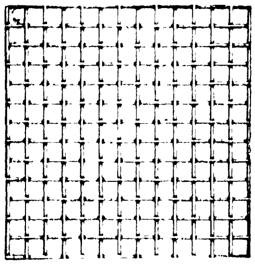
(Nickel) Silver
  Nickel
  Monel Metal
  Phosphor Bronze



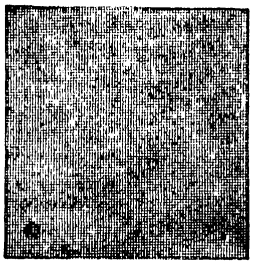
⅝ Mesh. No. 7 Steel



5 Mesh. No. 13 Steel



9 Mesh. No. 22 Steel



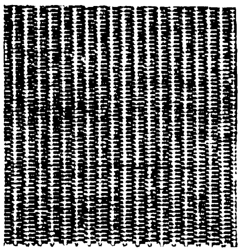
60 Mesh. No. 38 Steel

A FEW OF OUR MANY TYPES OF WIRE CLOTH

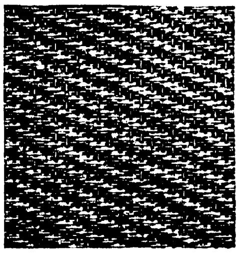
FILTER CLOTH:

For filtering water and other liquids requiring the exclusion of minute particles of foreign matter, the special weave herewith illustrated is admirably adapted, as it permits the use of larger wire and closer spacing of same than any other style of weaving, and offers the maximum resistance to heavy hydraulic pressure and wear.

In these fabrics, sometimes described as "Dutch Weave," the filling wires are slightly flattened by being forced and held in close contact with each other, thus the resulting mesh, in this member, is the smallest that can be produced.



**14 × 85 Mesh.
Nos. 27 32, Dutch Weave**



**16 × 40 Mesh.
Nos. 28/27, Dutch Twilled Weave**

Continued on Next Page

WILLIAMS PATENT CRUSHER & PULVERIZER CO.

GENERAL OFFICES AND WORKS

ST. LOUIS, MO., U. S. A.

Chicago Office and Showroom
1615 Old Colony Building

San Francisco Office and Showroom
67 Second Street

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delphia

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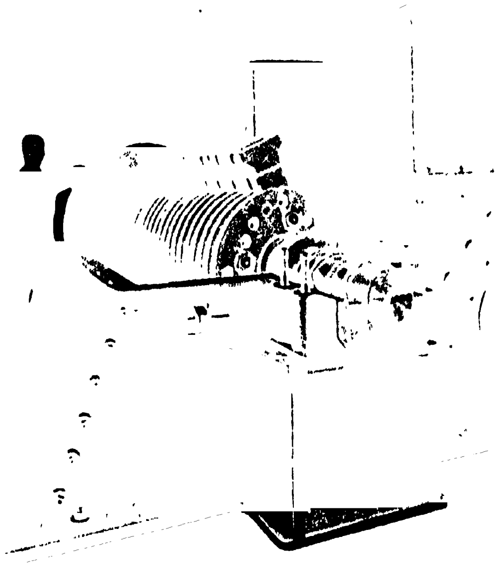

MACHINE OPEN SHOWING HAMMERS

LITERATURE

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NO 23 D	**NO 23 E**	**NO 23 F**	**NO 23 G**
Stock Food Cereals Alfalfa and all By Products from Flour Mills	Coal Crushers for Coke Ovens Gas Plants and all Industrial Plants	Shredders for Bark Chips Wood Pulp Licorice Root and all Fibrous Material	Soap Powder All Drug Material Paper Stock and all Chemicals

THE WILL CORPORATION

Laboratory Apparatus, Glassware, Chemicals
815 MAPLE STREET, ROCHESTER, N. Y.

Cable Address
"WILCORP", Rochester

PRODUCTS

- **Asphalt Testing Apparatus**
- **Autoclaves**
- **Bacteriological Apparatus**
- **Balances and Weights**
- **Biochemical Testing Apparatus**
- **Blood Testing Apparatus**
- **Blowers**
- **Burners**
- **Calorimeters**
- **Cement Testing Apparatus**
- **Centrifuges**
- **Chemicals**
- **Colorimeters**
- **Crushing Apparatus**
- **Distilling Apparatus**
- **Electrolytic Analysis Apparatus**
- **Extraction Apparatus**
- **Filter Paper**
- **Furnaces, Electric and Gas**
- **Gas Analysis Apparatus**
- **Glassware**
- **Grinding Apparatus**
- **Hardware, Laboratory**
- **Hot Plates**
- **Hydrogen-ion Apparatus**
- **Hydrometers**
- **Metallographic Apparatus**
- **Microscopes and Accessories**
- **Microtomes and Accessories**
- **Milk Testing Apparatus**
- **Motors**
- **Nitrogen Determination Apparatus**
- **Oil Testing Apparatus**
- **Ovens, Electric and Gas**
- **Photomicrographic Apparatus**
- **Polariscopes**
- **Porcelain Ware**
- **Pulverizing Apparatus**
- **Pyrex Glassware**
- **Reagents**
- **Refractometers**
- **Resistance Glassware**
- **Saccharimeters**
- **Serological Apparatus**
- **Shaking Apparatus**
- **Silica, Fused**
- **Spectroscopes and Accessories**
- **Spectrographs**
- **Spectrometers**
- **Spectro-Photometers**
- **Sphygmomanometers**
- **Stains, Bacteriological and Biological**
- **Syringes**
- **Tar Testing Apparatus**
- **Thermometers**
- **Urine Analysis Apparatus**
- **Vitreosil**
- **Water Analysis Apparatus**
- **Water Baths**
- **Water Stills**

ABRIDGED CATALOG

In the following pages, we are presenting an abridged catalog on laboratory apparatus, which, while quite comprehensive in scope, covers only the more commonly used types of equipment. Practically all material is arranged in alphabetical sequence except for several well-defined groups, as for example, **Asphalt-Testing, Cement-Testing, Balances and Weights, Oil-Testing, etc.** Accessories are, in some cases, listed with the particular item with which they are to be used. As a general rule, products are listed under that word of the name which indicates the use, as, for instance, "Flexible Metallic Tubing" will be found under "Tubing" and not under letter "F" or "M."

We offer not only these materials as listed, but, comprehending your exact needs, we are in a position to supply promptly any type of apparatus or equipment required.

We are able to advise you as to the type and capacity of apparatus required for any stated purpose or to arrange a list of equipment in proper quantities for your own particular requirements.

POLICY

Our business is conducted with the view of rendering with each transaction a service that will strengthen the confidence of our clients and will form a basis of a mutually pleasant and valuable relationship.

It is our aim to supply equipment of high quality only and to maintain in stock at all times such items as are here being listed so that immediate delivery can be made.

SERVICE

Since our previous representation in this Catalog, we have kept pace with the advances made in the field of laboratory apparatus and equipment. We have added to our existing line a number of specialties so as to be able to supply promptly anything required by the chemist or technologist in his routine, special or research work.

Our staff includes experts in the several chemical lines whose knowledge and experience are available at all times. We will gladly supply our disinterested opinion upon any piece of equipment without regard for the source and will recommend the particular apparatus best suited for the purpose in hand.

We would be pleased to assist in the development of new equipment or in the standardization of sizes and quality of materials and shall welcome, at all times, inquiries along these lines.

RESEARCH

We maintain well-equipped laboratories for the production of laboratory chemicals, biological dyestuffs, indicators and rare organic compounds. Special volumetric test solutions can be made up with a high degree of accuracy and the ordinary volumetric solutions are maintained in stock and periodically checked to insure absolute accuracy.

CHEMICALS

We carry in stock a complete line of reagent chemicals and prepared reagents. These include the products of the J. T. Baker Chemical Company, Merck and

Continued on Next Page

Mallinckrodt. Special biochemical and clinical reagents, dyestuffs and stains prepared in our own laboratory are immediately available and their quality is guaranteed without reservation.

We have developed on a commercial scale the production in our own laboratories of superior grades of several chemicals, among which can be listed the following:

Acetamide
Azolitmin
Benzidine
Carminic Acid
Malic Acid (Natural)
Neutral Red
Purified Litmus
Picramic Acid
Soda Lime
Sulfocyanates
Titanium Trichloride

These we are prepared to furnish promptly from stock and we solicit your inquiries.

GLASS-BLOWING

We have enlarged our glass-blowing department so that its facilities and expert personnel permit of the accurate production of any piece of glass apparatus from sketch, blueprint or submitted samples. We would be pleased to present at any time estimates on the probable cost of making up any special glass apparatus in which you are interested.

STANDARDIZATION

We have constantly aimed to standardize equipment, reagents and chemicals used in laboratory work and will gladly further any movement along these lines. The idea of standardization will dominate in our policy and we feel sure that, as time progresses, more and more uniformity of our products will result. We have already complied with the suggestions made by the committee upon standardization and apparatus of the American Chemical Society and can furnish reagent chemicals in the metric system unit sizes according to its specifications.

PUBLICATIONS

As our exceedingly comprehensive stock of glassware includes all types and sizes used in chemical, biological and allied laboratories, it was thought advisable to publish a special Glassware Catalog in which are also included American made porcelain, silica ware and gas analysis equipment.

A very comprehensive Bacteriological Catalog, embracing the biochemical and pathological field, has also been published. This is a 600-page book, 7″ x 10″ in size, and covers this field in a more complete manner than has ever been previously attempted. Due to the limited edition of this catalog, its distribution is necessarily restricted.

A special treatise on Water Stills has been published in the form of a pamphlet of 44 pages, in which all of the standard makes of Water Stills are carefully described and analyzed in detail. This covers Stills operated by electricity, gas, steam, gasoline and kerosene.

Our Bulletin 100, covering our new **Elliott "Ion-O-Meter,"** is now available. It is descriptive of a new type of Hydrogen-ion equipment that is by far the simplest in construction and, at the same time, of as high accuracy as any existing equipment of this character.

In addition to the above we distribute reprints, circulars and bulletins on various other subjects that are available to all interested.

Requests for literature pertinent to your field of activity will be promptly complied with. Where desired, we will gladly place your name on our mailing list for the regular submittal of future publications that will be issued by us.

PRICES

Prices listed include the cost of packing f. o. b. Rochester and are subject to change without notice, depending upon market fluctuations.

With the approach to a more normal condition, as regards the costs of labor and raw materials, a decline as compared with former prices has been anticipated and considered by us in our present calculations. And, inasmuch as a downward tendency exists, we shall continue to observe developments in this direction in a most thorough manner, with a view of granting to our patrons in all cases the benefit of whatever further price reduction will occur.

Whether estimates are asked for or not, the same price extensions will apply, without discrimination, and in this as well as in all other respects, the interests of our clients will be properly safeguarded.

TERMS

When ordering from this Catalog, please give catalog number, name of article and size desired. Specific information should be given in ordering accessory parts and in stipulating the current and voltage in the case of electrically equipped apparatus.

CREDIT AND FINANCIAL STANDING

To avoid delay, purchasers with whom we have no account and who have no mercantile rating, should accompany their first order with commercial references or remittance in cash, money orders, or New York or Chicago current funds, as a local check may be subject to collection charges. A 25% deposit should accompany all C.O.D. orders.

LIABILITY

In packing we triple-check all goods and obtain proper receipts from transportation companies. Unless otherwise specified, we shall use our best judgment in mode of shipping, prepaying transportation if requested and adding the amount to invoice. Due to our careful packing and checking, very little breakage or shortages occur. Shipments are insured and **if breakage or damage of any other character does occur the customer is guaranteed against loss,** but is urgently requested to immediately advise us, accompanying his report with detailed statement so that a formal claim may be entered by us against transportation company. Credit will be issued to cover this loss or a replacement made at the customer's option. As claims for shortages are frequently made, due to too casual inspection of the packing, we suggest a minute examination of all packing materials for small items.

GUARANTEE

We exercise the utmost care in manufacturing and packing. In case of faulty goods inadvertently reaching our customers, we shall feel under obligation if our attention is called thereto.

RETURN OF GOODS

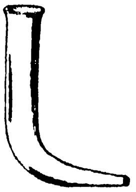
Goods being returned for any reason should be plainly tagged with the sender's name and address. Special identification tags are furnished on request. Wherever possible, please give date of invoice on which the goods were originally billed.

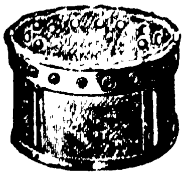
Continued on Next Page

LABORATORY APPARATUS

C-10005 Acid Pots Of an acid-resistant stoneware, very desirable in the larger sizes for waste jars in laboratories

No.	B	C	D	E
Capacity, liters	8	12	16	20
Each	1.10	1.65	2.00	2.50
No.	**F**	**G**	**H**	
Capacity, liters	24	30	40	
Each	2.90	4.50	5.25	


C-1015


C 100

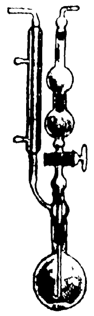
C-1015 Adapters- Curved Of heavy glass, for connecting retorts with receivers

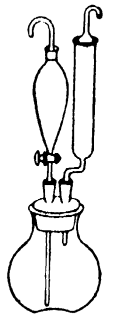
No.	A	B	C	D
Length, mm	150	180	200	250
Diameter, mm (Inside large end)	18	25	32	38
Each	.17	.18	.23	.27

C-1020 Adapters Straight Sizes and prices same as No C-1015.

C-100 Air Baths Of asbestos reinforced and ventilated, round for flasks

No.	A	B	C
Diameter, in	3½	4¼	5½
Each	1.25	1.50	1.80


C-1130


C-1135

C-1130 Alkalimeters — Knorr's — For the determination of carbonic acid in carbonates, as recommended by the Association of Official Agricultural Chemists, all joints ground together
Each 9.00

C-1135 Alkalimeters—Mohr's—New Model
Each 4.50

C-101 Aprons—For use in laboratory; of good quality rubberized material, waterproof and resistant to most chemical reagents, size 34" x 45"
Each 1.50

C-102 Aprons—For laboratory work Black rubber-coated, back of fine black and white checked cloth particularly desirable for domestic science work Of good quality; size 24" x 36".
Each .... .60

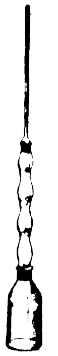
C-1165

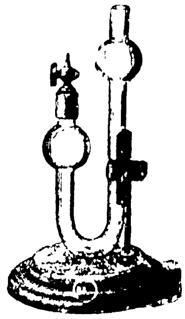
C-1165 Aquaria-High form, of heavy, clear, white glass, with ground rim and groove near top

No.	A	B	C	D	E	F
Capacity, gal..	½	1	1½	2	3	4
Height, in	5	6	8	8	9	10½
Diameter, in	6	7	8½	9	10	11
Each	.90	1.25	2.75	3.50	5.40	6.80
No	**G**	**H**	**I**	**J**	**K**	
Capacity, gal..	5	6	8	10	12	
Height, in	11	12	13	14	15	
Diameter, in	12	13	14	15	16	
Each	7.70	10.00	13.25	15.50	18.25	

C-1170 Aquaria-Low form, of heavy, clear, white glass; with ground rim and groove near top

No.	A	B	C	D	E	F
Capacity, gal..	¼	1	1¼	2	4½	8½
Height, in	4½	5	5½	6¼	8½	9¼
Diameter, in	7	8	9	10	14	17
Each	1.65	2.00	2.35	3.00	5.60	13.20


C 1180


C-1185

C-1180 Arsenic Apparatus — Gutzeit-Bragg's — With all ground joints
Each 1.75

C-1185 Arsenic Apparatus—Marsh's—For the detection of arsenic, complete with brass stopcock.
Each 3.50

C-1190 Arsenic Apparatus—Marsh's—Glass parts only
Each 2.75

C-10310 Asbestos Board—Fire and acidproof, in sheets 1 meter square

No.	A	B	C	D
Thickness, mm	75	1.5	2.25	3
Weight, kilos	75	2	2.50	3.50
Per lb	.35			
No.	**E**	**F**	**G**	**H**
Thickness, mm	5	6	9	12
Weight, kilos	5	7	10.5	14
Per lb	.35			

C-10335 Asbestos Mittens—Fire and acidproof.
Per pair 4.00

C-10365 Asbestos Paper—Extra thin; in sheets, 225 x 350 mm.
Per lb. .... .35

Asbestos cement, cloth, cord, wood, wool, and metal bound mats can be supplied.

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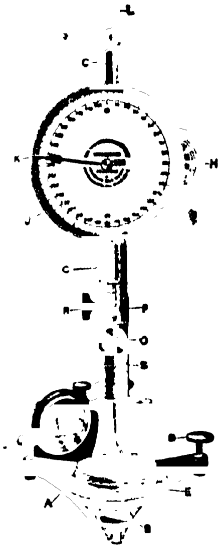
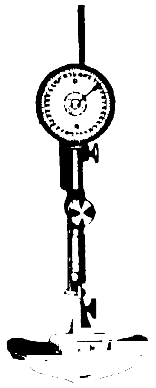
APPARATUS FOR TESTING ASPHALT AND OTHER BITUMINOUS MATERIALS



C-105

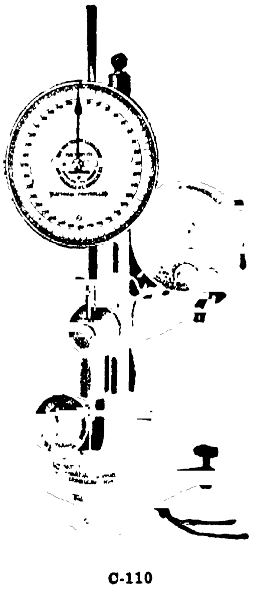
C-105 Penetrometer — New York Testing Laboratory Type—For determining the consistency of asphalt cement or similar material by determining the depth to which, under a definite load and during the given time, a standard needle will penetrate. A stopclock attachment fixed to the standard measures the time while depth of penetration is measured in tenths of a millimeter on dial. Supplied with adjustable weights which permit of use of a 50, 100, or 200 gram load upon the needle as desired, with instructions for use
Each ....Net 112 50



C-107

C-107 Penetrometer — Miniature Size—Similar to No C-105 above, but of about one-half size permitting of greater portability, needle and bar are standardized to 100 grams using the same needle as in the larger instrument
Each .. .Net 56.50

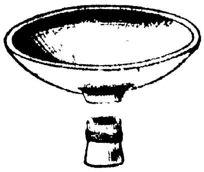
C-108 Extra Needles for use with the above
Each . . Net .60



C-110

C-110 Penetrometer — New York Testing Laboratory Type -Electrically controlled For operation on 110-volt DC lines or with six dry cells of 20 to 25 ampere capacity each This instrument entirely eliminates the personal equation and gives accurate penetration at each test Cannot be used on alternating current except through a rectifier.
Price on application

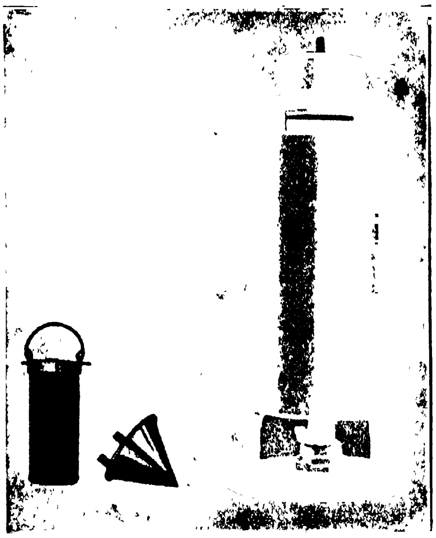
C-112 Penetrometer — Same as above, but for alternating current with rectifier.
Price on application



C 114

C-114 Asphalt Viscosimeter for controlling the consistency of bituminous binders, float made of aluminum, with three brass plugs, standardized
Each . ... .Net 16.50

Crucible-Porcelain for determination of soluble bitumen, see under "Crucibles"



C 116

C-116 Extractor—New York Testing Laboratory Type--For the extraction of bituminous material from paving mixtures containing broken stone Consists of a metal cylinder inside of which fits a second cylindrical inner vessel which holds the following: wire basket holding sample of disintegrated paving material is suspended in inner vessel, inverted conical condenser with outlets for water circulation acts as top; heated by 16 C P carbon filament incandescent lamp and mounted on wooden base
Each .... .Net 61.75

C-119

C-119 Ring and Ball Apparatus Standard method for determining the softening point of bituminous materials other than tar products according to A S T M Furnished complete with thermometer and glass beaker of 600 cc. capacity.
Each ...Net 17.75

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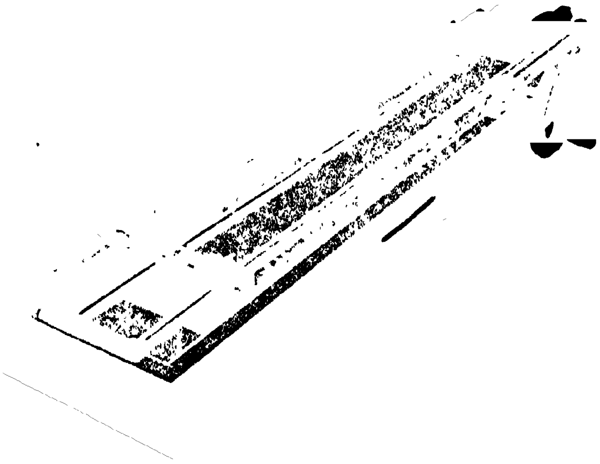
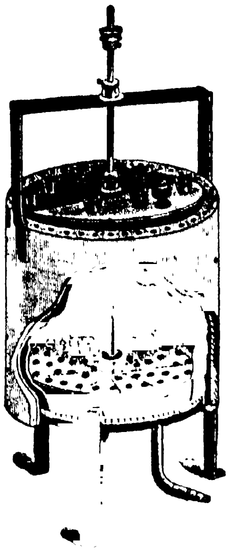


C 121

C-121 Ductility Machine — Smith's - Improved form for hand power with stone trough heavily enameled both inside and out, arranged for 110 cm pull and for three briquets
Each .... Net 281.00

C-123 Ductility Machine—Smith's - Improved form very similar to above, but electrically driven with direct connected motor for 110-volt direct current
Each .... Net 306 00

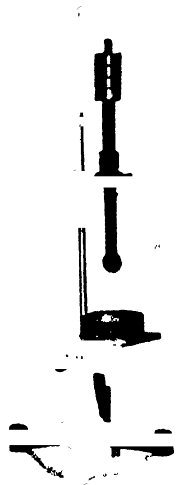
C-124 Ductility Machine—Smith's - Same as above, but for 110-volt alternating current
Each .... Net 356.00



C-126

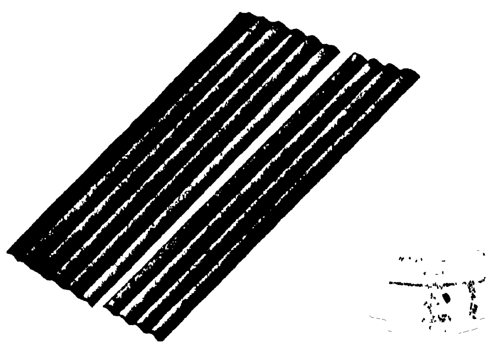
C-126 Oven—New York Testing Laboratory Type—Heated by ring burner underneath the space between the oven proper and the outside wall; fan mounted on ball-bearings which can be revolved by any convenient power hastens drying; made of Russian iron covered with asbestos, without thermometer.
Each .... Net 37.50

C-127 Oven, same as No **C-126** above, but of copper.
Each .... Net 45.00



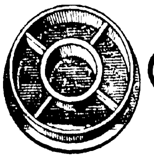
C-129

C-129 Adhesion Machine — Kirschbraun — For measuring comparatively the adhesive strength of asphalt as a binder for mineral conglomerates in the construction of roads and pavements Apparatus is attached to a support with double scale dynamometer reading to 250 grams in 10 gram divisions, a system of gears presses the sample against the ball and then removes it, scale records the adhesive pull under various conditions of speed and temperature Complete with two sample cups and directions.
Each .... Net 30.00

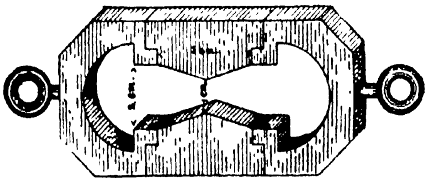


C-134

C-134 Asphalt Flow Plates—Set consists of two each, with six corrugations and one mould
Per Set .... Net 6.50



C-137



C-140

C-137 Bitumen Holder, Brass—Draper type.
Each .... Net 4.50

C-140 Briquet mould for asphalt.
Each .... Net 7.50

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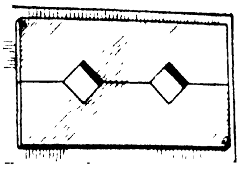
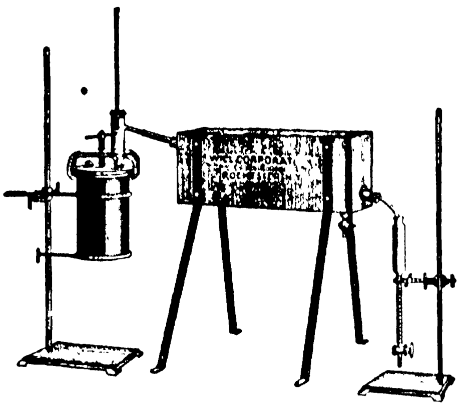


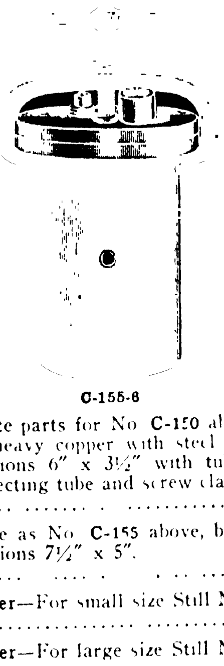
C-144

C-144	**Cube Mould**—For bitumen, ½", with plate Each . . . . Net	6.00



C-150

C-150	**Dehydrating Apparatus**—For tars and creosote oils—Used by The Barrett Co., and adopted as standard by A S T M, consists of copper still 6" x 3½" with steel clamps on proper supports with ring burner, copper condensing trough, connecting tube, separatory funnel, support and clamp but without thermometer Each	43.50



C-155-6

Separate parts for No C-150 above

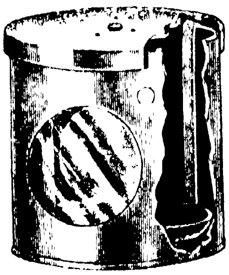
C-155	**Still**—Of heavy copper with steel clamp, inside dimensions 6" x 3½" with tubulated cover for connecting tube and screw clamp Each	19.50
C-156	**Still**—Same as No C-155 above, but with inside dimensions 7½" x 5". Each	25.50
C-159	**Ring Burner**—For small size Still No C-155. Each	2.55
C-160	**Ring Burner**—For large size Still No C-156. Each	3.00
C-163	**Connecting Tube**—Small size, glass Each	.50
C-164	**Connecting Tube**—Large size, glass Each	.60

Prices subject to change without notice

C-166	**Condenser Trough** Of heavy copper on support without condensing tube Each	15.50
C-168	**Condenser Tube** Of glass, about 22" long Each	.40
C-170	**Separatory Funnel** For water and tar with stopcock and glass stopper, capacity 120 cc., stem graduated 20 cc in 1 10 cc Each	4.00
C-173	**Thermometer** For use with No C-150, graduated from 0°–400 C in single degrees Each	3.00

C 175

C-175	**Dish—Evaporating** With handle, made of pure sheet nickel, 2¼" diameter Each	2.25

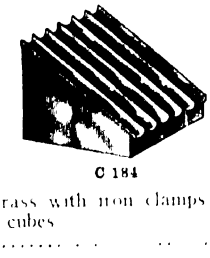


C-178

C-180

C-178	**Air Melting-point Oven**—With two mica windows and removable tray, of copper Each	10.00
C-180	**Penetrometer—Schutte** Of brass with brass plug Each	4.70

C-182



C 184

C-182	**Pitch Mould** Of brass with iron clamps and brass block, for ½" cubes Each	6.00
C-184	**Slide Box**—Of polished copper with six corrugations Each	5.00

Additional equipment of a general nature for use in the testing of Asphalt and Cement can be found under various captions throughout the body of the Catalog, and several items of interest will also be found under the section on Cement Testing Equipment. Practically all equipment recommended by the American Society of Testing Materials can be supplied, and we solicit your inquiry.

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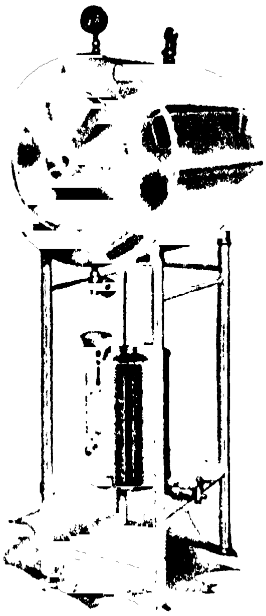
AUTOCLAVES



C-10375

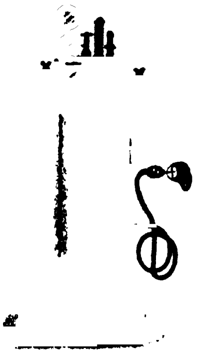
C-10375 **Autoclaves, Eclipse—With Horizontal Chamber—** Cylindrical in form, differing from ordinary steam pressure sterilizer principally in method of jacketing, made of heavy, polished copper, with double wall, inner door of solid, cast brass, rolling on track inside instrument, each autoclave fitted with interior shelf, water gauge, pressure gauge and safety valve, and mounted on white enameled iron stand as illustrated, either gas, steam, petroleum, acetylene gas or other fuel may be used for heating, and method to be employed should be stated when ordering, autoclave may be used as ordinary free steam sterilizer by leaving air-cock open, which will prevent accumulation of steam and maintain a temperature of 100°C

No.	A	B	C	D	E
Length, inside, cm ..	80	71	61	51	41
Diam., inside, cm. .	63	56	51	41	32
Diam., Door Opening, inside, cm .	41	35	30	25	20
Each ...	416.00	313.00	262.00	220.00	180 00
Boxing, extra	12.00	12.00	10.00	10.00	10.00

C-10380 **Autoclaves, Eclipse—With Horizontal Chamber—** Same as No **C-10375** above, but nickel-plated

No.	A	B	C	D	E
Length, inside, cm ..	80	71	61	51	41
Diam., inside, cm. .	63	56	51	41	32
Diam., Door Opening inside, cm	41	35	30	25	20
Each . . .	447.00	338.00	280.00	235.00	190.00
Boxing, extra	12.00	12.00	10.00	10.00	10.00

C-10385 **Autoclaves — With Riveted Boiler**--Designed for sterilization under steam pressure, boiler made of heavy, polished copper, tin-lined, with spun bottom and provided with perforated tray having two shelves, lid of cast brass, nickel plated and fitted with ground joint, no washers being required to make it steam-tight, hinged lid is supplied on every apparatus of the larger size and is optional on the small sizes, provided with pressure gauge, thermometer and safety valve and tested and guaranteed to withstand pressure of 35 lbs. per square inch, supplied with either gas or electric equipment, as indicated; for gas heating a larger burner is provided; for electric equipment be sure to state voltage and current when ordering.

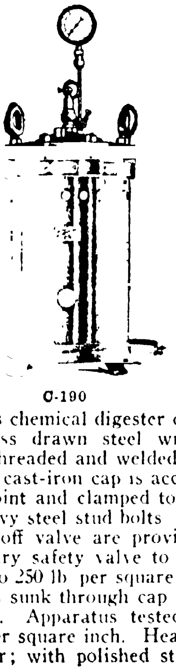


C-10385

No.	A	B	C	D	E	F
	Gas	Electric	Gas	Electric	Gas	Electric
	With hinged lid		Lid not hinged		With hinged lid	
Depth, inside, cm .	67	67	60	60	60	60
Diam., inside, cm	35	35	28	28	28	28
Extreme hght., incl base cm	115	115	110	110	110	110
Each	126.00	196 00	91 00	144 00	98.00	151.00

C-10390 **Autoclaves — With Riveted Boiler**--Same as No **C-10385** above, but nickel-plated

No.	A	B	C	D	E	F
	Gas	Electric	Gas	Electric	Gas	Electric
	With hinged lid		Lid not hinged		With hinged lid	
Depth, inside, cm .. .	67	67	60	60	60	60
Diam., inside, cm .	35	35	28	28	28	28
Extreme hght., incl base cm	115	115	110	110	110	110
Each	133 00	203.00	98.00	151.00	105.00	158.00



C-190

C-190 **Autoclave**—This chemical digester consists of a boiler of seamless drawn steel with 5/16" wall to which is threaded and welded a heavy cast-iron collar A cast-iron cap is accurately fitted with packing-joint and clamped to the pot by means of six heavy steel stud bolts A pressure gauge and blow-off valve are provided together with an auxiliary safety valve to be used for pressures up to 250 lb per square inch Thermometer well is sunk through cap to within one inch of bottom. Apparatus tested hydraulically to 1000 lb per square inch. Heated by high-power gas burner; with polished steel jacket.

No.	A	B	C
Diameter, in....................	6	8	10
Depth, in	12	12	12
Each ....Net	150.00	175.00	195.00

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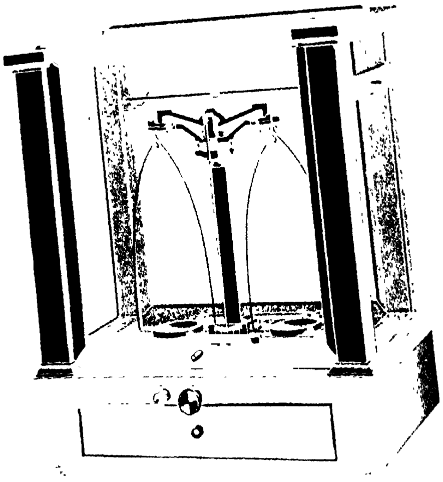
BALANCES AND WEIGHTS

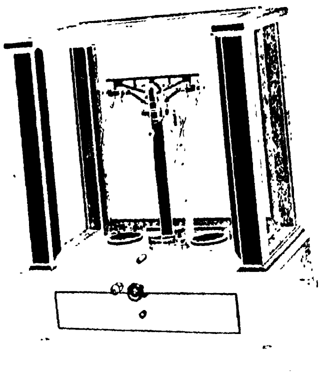
The balances listed represent but a small number of those that can be furnished, but limited space demands that but a representative selection be shown. All standard makes of American balances can be supplied, the larger number of which are maintained in stock for immediate delivery. We will be pleased to submit complete information on any balance or special scales that you may require.



C-10410

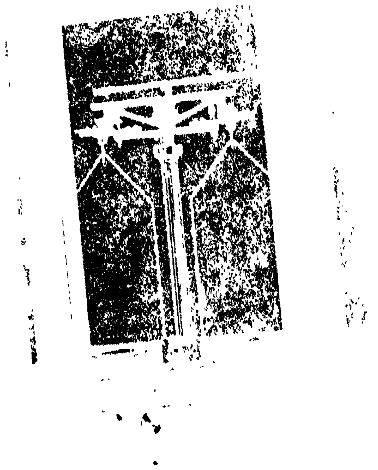
C-10410 Balance, Analytical—Becker's—Capacity, 200 grams—sensitiveness, 1/10 mg, diameter of pans, 3 in, length of beam, 6 in, bearings, agate, knife-edges, agate, aluminum beam graduated in 1/10 mg with white graduations on black background, independent arrest for pans with automatic stop, width of pan support, 4 in (wider if specified), polished mahogany and glass case, glass top, front sliding frame counterpoised, dimensions of case: 16¼ in long, 9 in wide, 8½ in high, mounted on plate glass base
Each .... Net 110.00

C-10415 Balance, Analytical—Becker's—Same as No C-10410 above, but without plate glass base
Each ....Net 100.00



C-10417

C10417 Balance—Analytical—Becker's Chainomatic—Capacity 100 gm with sensitiveness of 1/20 gm. Specifications same as No C-10410 except for chainomatic feature Capacity of bar and vernier 50 mg to 1 10 mg Mounted on plate glass base
Each .... Net 150.00



C-10420

C-10420 Balance, Analytical—Voland's Senior Model—Capacity, 200 gm in each pan, sensitiveness, 1/10 mg under full load; knife edges and bearings of finest Russian agate, accurately ground; beam, specially hard rolled aluminum, 6 in long, graduated center (zero point) to each end, in white inlaid on black background; hangers, 4 in wide, pans, 2½ in in diameter, triple beam arrest with drop movement, rider carrier operates over entire beam without obstruction, and patented rider hooks prevent rider from dropping back on shank of hook; column base, circular with two vial levels always in view of operator; red graduated index plate above column base has black pointer tip, red graduations having been proved to be most easily read, as established by the U. S Government, which now insists on red graduations, case, of mahogany with sliding doors, the front counterpoised, the rear removable; 4-in space in front of column base accommodates set of weights inside case, mounted on plate glass base
Each .... Net 100.00

C-10425 Balance, Analytical—Voland's Senior Model—Same as No C-10420 above, but without plate glass base
Each .... Net 92.00

C-10430 Balance, Analytical—Voland's Professional Model—Same as No C-10420 above, but adjusted to sensitiveness of 1/20 mg, mounted on plate glass base
Each ....Net 110.00

C-10435 Balance, Analytical—Voland's Professional Model—Same as No. C-10430 above, but without plate glass base.
Each ....Net 102.00

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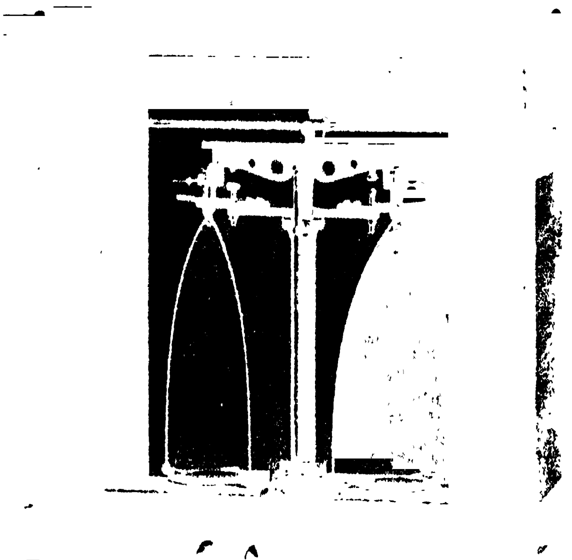
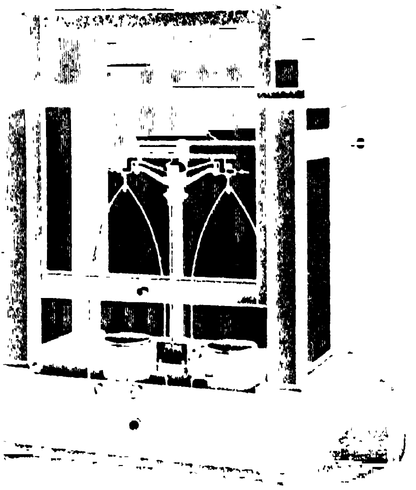


C-10440

C-10440 Balance, Analytical—Voland's Junior Model—Especially suitable for quantitative analysis in the educational laboratory, because of its accuracy, durability and quick action, combined with reasonable price, capacity, 200 gm in each pan sensitiveness, 1/10 mg under full load, knife-edges and bearings of agate; beam of aluminum, right arm graduated into 1/5 mg, in white inlaid on black background; hangers, 7¼ in high and 4¾ in wide, pans, 2½ in in diameter, arrest supports, beam and hangers with freedom from contact between edges and bearings, release by single action, making contact of center and end knives with bearings simultaneous, self-locking pan arrests with adjustable push-button, rider-carrier runs in support above column in addition to side wall opening, patented rider hook prevents rider from dropping back on shank of hook, plummet suspended at back of column with adjusting point for leveling, red graduated index plate above column base at front has black pointer tip, red graduations being most easily distinguished and now demanded by the U S Government, case of mahogany, with counterpoised front door

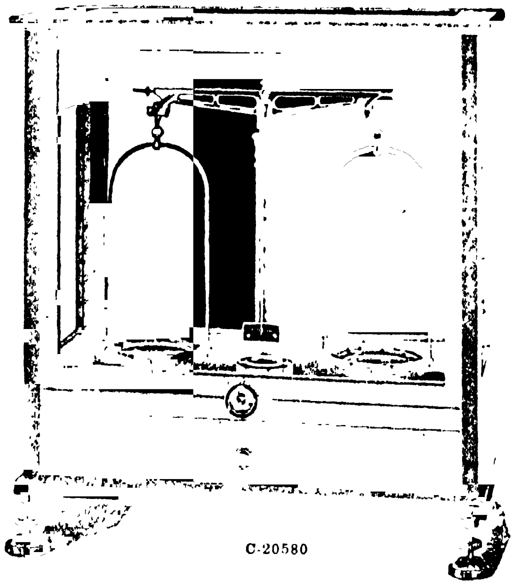
Each . . . . Net 48.00



C-10442

C-10442 Balance, Analytical—Junior Model—Capacity 2 gm sensitiveness 1/10 mg Edges and bearin of agate Beam of aluminum, 6 in with gradu tions both sides of center Hangers 4½ in pans 3 in Drop arrest and double rider carrier Level at base of post Finely finishe case with drawer

Each . . . . Net 60 00



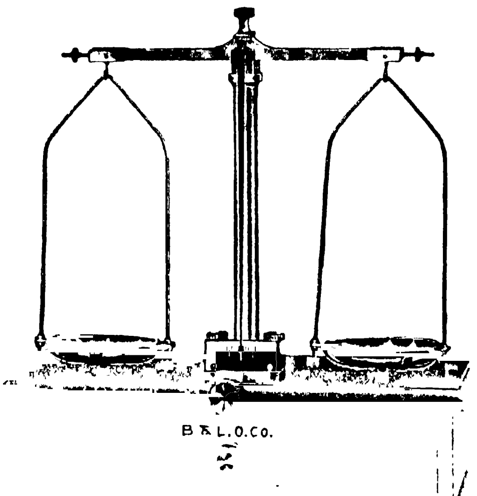
C-20580

C-20580 Balances—General Laboratory—Especially adaptable to secondary schools and for elementary college work, and will likewise be found very useful in industrial laboratories where weighings requiring a fairly high degree of accuracy are required, sensitiveness 2 mg under full load, capacity 100 grams, beam 200 mm with adjusting screws at both ends; eccentric beam lifting device; plumb-bob for leveling, mounted in rear of post, 3 leveling screws for balance rests, bows 90 mm wide, pans 80 mm diameter; case of French mahogany with glass sides and top and with sliding doors in both back and front, finished in highly polished brass, lacquered, with agate bearings

Each 27.50

C-20582 Balances — General Laboratory—Same as No C-20580, but with steel bearings instead of agate

Each 25.00

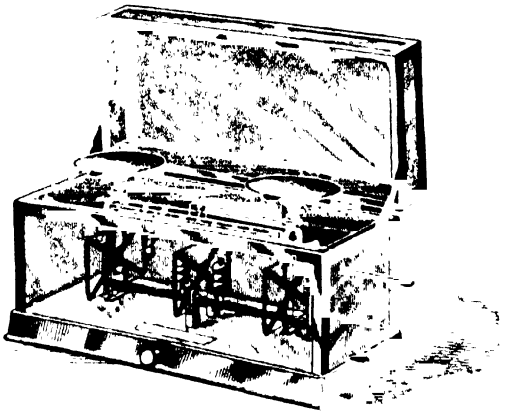


C-20658

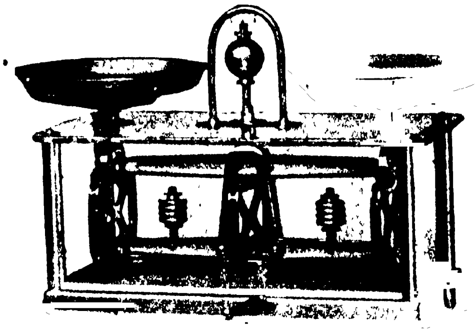
Prices subject to change without notice

Continued on Next Page

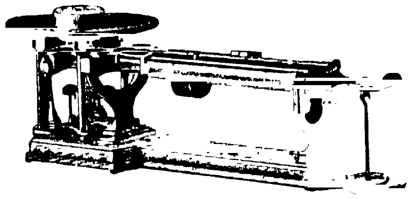
C 20658 **Balance, Chemical—Sensibility,** 1 cgm Length of beam 150 mm Made of brass heavily lacquered Has eccentric lift Mounted on base with drawer
• Each . . Net 14 00


C-10445

C-10445 **Balance, Torsion—Prescription Model**—Capacity, 120 gm , sensitiveness, 2 mg , pans of German silver, 75 mm in diameter , rider beam graduated on upper edge from ⅛ to 8 grams and on lower edge from 5 mg to 5½ decigrams, in glass case with cover
Each . . Net 60 00


C-10447

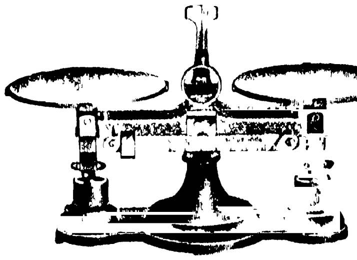
C-10447 **Balance—Torsion Glass Box Scale**—Capacity 4½ kilos or 10 pounds, sensitiveness 1/15 gm Brass pans, nickel plated, 8 in diameter Arrest for quick weighing
Each .... Net 65 00


C-10460

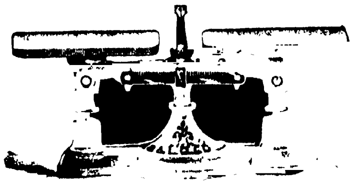
C-10460 **Balance, Solution — Troemner's** — Designed for weighing liquids with accuracy; capacity, 20 kilos, sensitiveness, 1 gm ; two weighing beams and sliding poises, one divided into 100 parts, each of which represents 1 gm ; other beam divided into 10 parts, each representing 1 gm , a bar with sliding poise is placed under the weighing beams for balancing the empty containers
Each ... .Net 75.00

C-10467

C-10467 **Balance—Laboratory Scale** On iron base with nickel plated pans, upright indicator and ivory index, regularly furnished with steel bearings and brass weights Weights set in block integral with base, capacity 300 grams, sensibility 1/10 gram, diameter of pan 6" with set of weights 100 grams down With side beam 1/10 to 8 gm (not shown in cut)
Each . . . . . .Net 22.00


C-10470

C-10470 **Balance, Improved Trip Scale—Harvard Design**—Rough cast and forged iron parts have been replaced by parts of brass and steel, properly formed by tools and machinery, making them uniformly accurate and assembled with a degree of rigidity heretofore impossible, bearings consist of hardened, steel prisms, resting on six agate shelves of large dimensions, graduated beam has range of 10 gm in 1/10 gm divisions, capacity, 2 kilos, sensitiveness, after continued use, guaranteed to 1/10 gm, but actual tests have shown sensitiveness greater than 0 01 gm
Each . ...Net 12.00


C-10475-76

C-10475 **Balances—Harvard Trip** Excellent for general laboratory use, capacity, 1 kilo, sensitiveness, 1/10 gm ; beam graduated up to 10 gm in 1/10 gm divisions, has two porcelain plates 150 gm square.
Each .... Net 9 00

C-10476 Same as above, but graduated in oz
Each ....Net 9.00

C-10477 Same as No **C-10475,** but round plate
Each ....Net 9 00

C-10478 Same as No **C-10476,** but round plate
Each .... .Net 9.00

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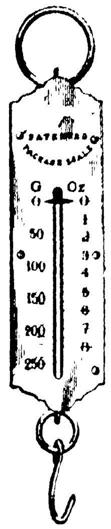
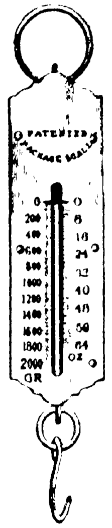


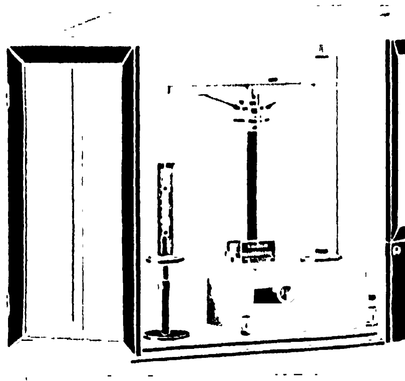
C 192



C 193

C-192 **Balances—Spring**—Graduated in English and Metric systems with broad pointer and nickel-plated front for either perpendicular or horizontal reading, reads to 8 ounces in ½ ounce divisions, and to 250 grams in 5 gram divisions
Each 1 60

C-103 **Balances—Spring**—Graduated in English and Metric systems with broad pointer and nickel-plated front for either perpendicular or horizontal reading; reads to 4 pounds in 1 oz divisions, and to 2,000 grams in 10 gram. divisions
Each 2.00



C-195

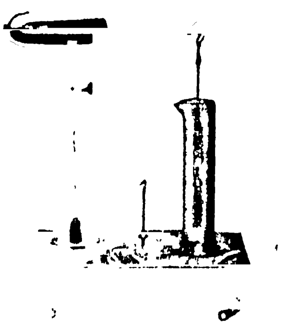
C-195 **Balance—Specific Gravity—Chainomatic**—Gives direct reading of Specific Gravity without use of weights or riders by use of chainomatic principle Specially constructed case reduces air disturbances Range to 2.0000 Specific Gravity In case
Each ....Net 100.00

C-196 **Balance—Specific Gravity—Chainomatic**—Same as No C-195, but without case
Each ....Net 85.00

C-200 **Balance—Specific Gravity—Chainomatic**—Similar to No C-195, but with range to 3.500 to third decimal place
Each ....Net 100.00

Prices subject to change without notice

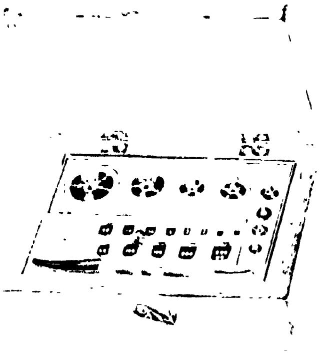
C-201 **Balance—Specific Gravity—Chainomatic—Same** as No. C-200, but without case
Each ....Net 85.00



C-10495

C-10495 **Balance, Specific Gravity—Westphal's**—For determining specific gravity of both liquids and solids, made of aluminum and furnished in portable case, with jar, riders, plummet, pincets and weight
Each 27.50
Plummet only, for No C-10495 above
Each 5.00
Riders only, for No C-10495 above
Per set of 8 .... 2.50

C-205 **Balance Covers**—Of rubberized material Please state size or make of balance when ordering
Each 2.00



C-10540

C-10540 **Weights, Analytical—Voland's**—First quality, gold-plated, of brass screw-knob type, accurately adjusted; for general use, fractions from 500 to 50 mg are platinum, from 20 to 1 mg are aluminum, each weight fitted in separate compartment in mahogany, velvet-lined box, with loose or hinged cover.

No.	A	B	C	D
Grams	10	20	50	100
Milligrams	1/10	1	1	1
Riders	. ..	3	3	3
Per set ....Net	24.75	26.25	29.00	32.50

No.	E	F	G
Grams	200	500	1000
Milligrams	1	1	1
Riders	3	3	3
Per set ....Net	42.50	50.00	60.00

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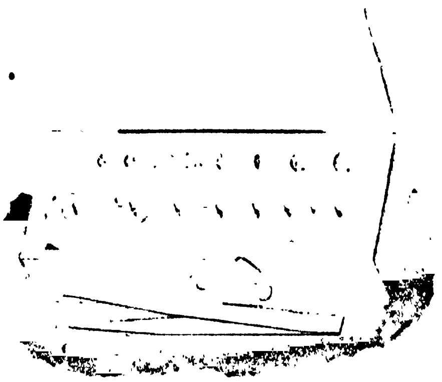
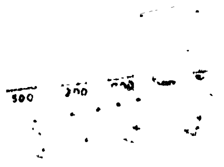


C-10545

C-10545 Weights, Analytical — Voland's — Second grade; made of brass, in two pieces, polished and lacquered, fractionals of German silver and aluminum, furnished in mahogany box with hinged cover

	No.	A	B	C	D
1 mg to		10	20	50	100
Per set	Net	9 75	11 00	13 50	16.00

	No.	E	F	G
1 mg to		200	500	1000 gm
Per set . . .	Net	20.00	23 00	30.00



C-10555

C-10550 Weights, Analytical—Troemner's—Second grade, made of brass, with tapered body and screw-knob, all adjustment being made on the knob stem, no loose balancing material being used, weights polished and lacquered, fractionals of sheet aluminum, with one entire side turned up to facilitate handling, furnished in natural mahogany block with hinged lid, each weight in a separate compartment

	No.	A	B	C	D
1 mg to		10	20	50	100
Per set .	Net	11.00	13.50	16 00	17.00

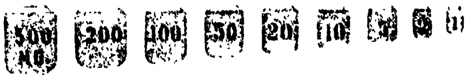
	No.	E	F	G
1 mg to . . .		200	500	1000 gm
Per set . .	Net	20.50	25.00	30 00

C-10555 Weights, Analytical—Troemner's- Same as No C-10550 above, but furnished in box without lid

	No.	A	B	C	D
1 mg to .		10	20	50	100
Per set .	Net	9.75	11.00	13.25	14.50

	No.	E	F	G
1 mg to		200	500	1000 gm
Per set	Net	18.00	23.00	29.00

Prices subject to change without notice



C 10560

C-10560 Weights, Fractional- Made of platinum, first quality

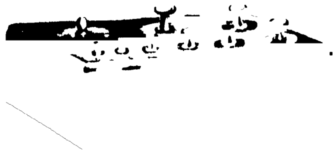
	No.	A	B	C	D	E
Mg .		1	2	5	10	20
Each	Net	1.35	1 45	1.70	1.80	2.30

	No.	F	G	H	I	J
Mg .		50	100	200	500	1000
Each	Net	3 00	4 00	5 00	6.50	9.75

C-10565 Weights, Fractional Made of aluminum.

	No.	A	B	C	D	E
Mg .		1	2	5	10	20
Per set	Net	.30	.30	.30	.30	.30

	No.	F	G	H	I
Mg		50	100	200	500
Per set	Net	.30	.35	55	.65

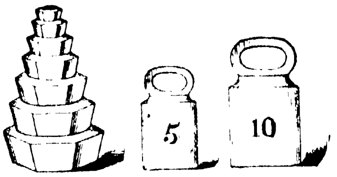


C-10570

C-10570 Weights -Ordinary grade, brass, lacquered

	No.	A	B	C	D
10 mg to .	. .	20	50	100	200
Per set .	Net	2 20	2 70	3.60	5.25

	No.	E	F	G
10 mg to		500	1000	2000 gm
Per set .	.. Net	8.50	13.25	18.00



C 10575

C-10575 Gram Weights- Of iron, for coarse weighing

	No.	A	B	C	D
Sets, 10 gm to . . .		1	2	5	10 kilos
Per set	Net	4.25	6.50	11.00	18 00

C-10600 Weights—Riders- Of aluminum

	No.	A	B	C	D	E
Mg		5	6	1	1 2	2
Each .	Net	1 05	1 05	85	85	.85

	No.	F	G	H	I	J
Mg		3	5	6	10	12
Each	Net	.85	.60	.60	.60	.60

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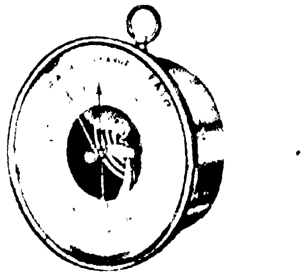


C-10605

C-10605 **Barometer—Aneroid** Compensated for temperature and absolutely accurate, supplied to U S Navy, U S Weather Bureau and many scientific and educational institutions, is practically non corrosive, nickel-steel or phosphor bronze parts being used wherever practicable, instead of steel, lacquered brass case, open center silvered metal dial, engraved and divided with great accuracy

No.	A	B
Diam of dial, in	5	6
Each . .	20 00	25.00

C-10610

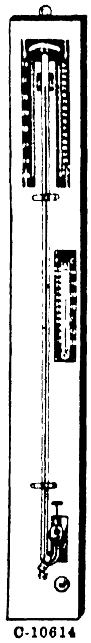
C-10610 **Barometer—Fortin. U. S. Weather Bureau Type** - Most substantial and accurate instrument, length, 40 in , graduated in inches and millimeters, and can be read to 0 01 in and 0 1 mm , tube is made of gun metal, mounted on polished, hardwood back, with thermometer attached to tube, provided with sliding vernier, operated by screw on side, scale is made of white porcelain, with black figures, and cannot discolor as all metal scales do

Each . Net 80 00

C-10614 **Barometers—Improved Mercurial**—Especially designed for school use, for use in altitudes from sea level to 3,000 feet, double scale, in inches and millimeters with double verniers, reading to 1/100th inch and 1/10th mm , black oxidized finish, brass scale, and vernier with white filled figures, sliding scale to allow for changing level of mercury in system, screw attachment for blocking mercury, mounted on oak board with Fahrenheit and Centigrade scale thermometer, length 39 inches

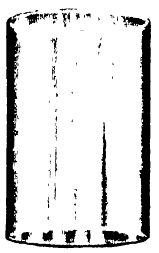
Each 28.50

The above can be supplied for use in altitudes up to 5,000 and up to 8,000 ft. at an additional cost



C-10614

Prices subject to change without notice



C-1210

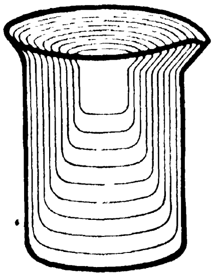
C-1215

C-1210 **Battery Jars**—Of clear, white glass, with ground rim

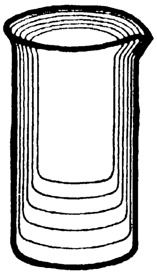
No.	B	F	I	J	K
Capacity, liters	1	3½	3	4	10
Height, mm	125	200	275	225	300
Diameter, mm	100	150	125	150	200
Each .	.45	75	.80	.90	2.00

C-1215 **Battery Jars**- Square form, with straight, ground top

No.	B	C	D	E	F
Capacity, oz .	27	29	30	32	57
Height, in	5	4	6	7	8
Length, in	3½	4	2½	2½	4
Width, in	3½	4	4¼	4¼	4
Each	.50	.50	65	.65	.75



C-1220



C 1240

C-10625 **Beakers, Aluminum**—Of superior finish

No.	A	B	C	D	E
Capacity, cc	125	250	500	1000	2000
Each	.75	.95	1.35	1.85	4.25

C-10630 **Beakers, Copper**—Polished

No.	A	B	C	D	E
Capacity, cc	125	250	500	1000	2000
Each	.85	1 00	1.45	2.00	4 60

C-10635 **Beakers, Copper**—Nickel-plated

No.	A	B	C	D	E
Capacity, cc	125	250	500	1000	2000
Each	1.00	1.25	1.85	2.50	5 50

C-1220 **Beakers**—Of Pyrex glass, Griffin's low form, with lip

No.	A	B	C	D	E
Capacity, cc	30	50	100	150	250
No pieces in original case . .	312	216	156	156	168
Each . Net	.18	.18	.19	.21	.25

In full case lots, less 10% discount

No.	F	G	H	I	J
Capacity, cc	400	600	800	1000	1300
No pieces in original case	84	72	48	48	24
Each ... .. Net	.30	.35	.40	.54	.65

In full case lots, less 10% discount

No.	K	L	M	N	O
Capacity, cc	1500	2000	2500	3000	4000
No pieces in original case	24	12	12	10	10
Each ....Net	.73	.98	1.20	1.40	1.80

In full case lots, less 10% discount.

Continued on Next Page

C-1222 **Beakers—Dye Pots—Pyrex**—Tall form with heavy walls and without spout or flange

No	A	B
Capacity cc	400	600
No in original case	60	60
Each	.60	60

In full case lots less 10%

C-1225 **Beakers** Of resistance glass, Griffin's low form with lip

No.	B	D	E	G	J	L
Capacity, cc	50	100	150	250	400	600
Each	.14	.15	.17	20	.24	.28

No	N	O	P	Q	R	S
Capacity, cc	800	1000	1500	2000	3000	4000
Each	.32	.42	58	80	1 12	1 44

C 1240 **Beakers**—Of Pyrex glass, usual form, with lip

No.	A	B	C	D	E
Capacity, cc	100	150	200	300	400
No pieces in original case	156	120	168	144	60
Each Net	.19	.21	.23	.26	30

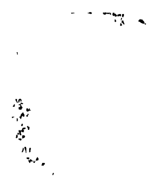
In full case lots, less 10% discount

No.	F	G	H	I
Capacity, cc	500	600	800	1000
No pieces in original case	60	60	48	36
Each ...Net	.32	35	.38	54

In full case lots, less 10% discount

C-1255 **Beakers**—Of resistance glass, usual form, without lip

No.	C	E	G	H	I
Capacity, cc.........	100	200	300	400	500
Each	.15	.19	.22	.24	.26



C-5510

C-5520

C-5510 **Beakers**—Coors porcelain, with lip, glazed inside and outside, with exception of outside bottom surface

No.	1	1a	2	3
Diameter rim, mm	62	66	74	87
Diameter body, mm	55	62	69	82
Height, mm	93	108	118	143
Capacity, cc	165	250	340	580
Each .. .. Net	1.02	1 20	1.32	1 62

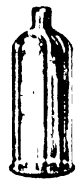
No.	3a	4	5	6
Diameter, rim, mm ...	93	103	114	122
Diameter body, mm .	90	100	110	118
Height, mm	154	167	198	209
Capacity, cc . .	700	970	1500	1775
Each .... Net	1.98	2.40	3.30	5.10

C-5520 **Beakers, Dye Pots,** without lip, with heavy supporting flange, glazed inside and outside with exception of outside bottom surface

No.	2	3	4
Diameter rim, mm	86	96	127
Diameter below flange, mm..	87	90	115
Distance rim to supporting flange, mm	42	42	38
Height, mm	128	136	184
Capacity, cc to level flange . ..	290	425	1125
Each ....Net	1.44	2.10	3.30

Prices subject to change without notice

C 1275



C-1295

C-1275 **Bell Glasses—High Form** With ground rim, larger sizes very useful for covering microscopes, etc

No.	C	H	K	L	O
Height, mm	225	350	425	425	450
Diameter, mm	175	200	215	225	250
Each .	2 25	4 00	6 00	7 25	13 50

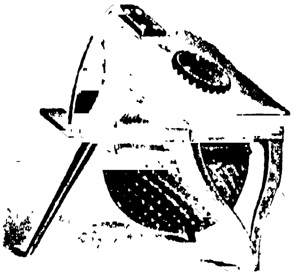
C-1295 **Bell Glasses—Open Top** Of clear, white glass, with ground rim

No.	A	B	C	E	F
Height, mm .	150	200	225	375	375
Diameter, mm	75	100	125	175	215
Each	1 30	1 70	2 25	3 20	5.50

C-1297 **Bell Glasses—Open Top** Similar to No C-1295, but with wide opening at top Sizes and prices the same as No C-1295.

C-10960 **Blowers—Fletcher's Foot Power** Produce a powerful, continuous blast, the pressure of which may be increased by adding one or more rubber discs to the air reservoir

No.	A	B	C
Diameter of air reservoir, mm	180	225	275
Each	9.50	12.50	17 25



C 10965

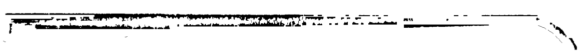
C-10965 **Blowers—Fletcher's Foot Power** Similar to No C-10960 above, but mounted on legs, as illustrated

No	A	B	C
Diameter of air reservoir, mm	180	225	275
Each	10.75	14.25	19.50

C-10970 **Extra Rubber Discs** for above

No.	A	B	C
Each	.75	1.15	1.65

C-215



C-217

C-215 **Blow Pipe**—Japanned metal with movable brass tip.
Each ... ... .18

C-217 **Blow Pipe**—Plain, of brass, jewelers' form

No.	A	B	C
Length, in . . .	8	10	12
Each	.18	.22	.28

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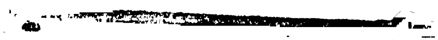
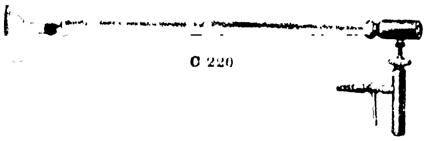


C 218



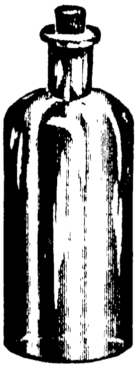
C 220

C-218 Blow Pipe Same as No C-217 above, but with air chamber

No.	A	B	C
Length, in	8	10	12
Each	.40	.45	60

C-220 Blow Pipe—Plattner's Nickel plated, with hard rubber mouth piece, but without platinum tip
Each 3.50

BOTTLES



C-1310

C-1310 Bottles—Narrow Mouth —Of best American flint glass, for cork stoppers

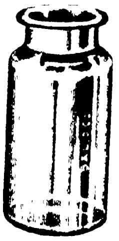
No	A	B	C	D	E	F	G	H	I	J	K	L
Capacity, oz	½	1	2	3	4	6	8	12	16	20	24	32
For cork No	2	2	3	3	4	4	5	5	6	6	7	7
No in orig case	864	864	720	576	432	360	288	216	144	120	120	96
Per dozen	60	70	.75	.90	1 00	1 15	1 30	1.60	1.80	2.20	2 70	2 80
Per gross in orig case	6 15	6.90	7.60	9 25	10.50	11.80	13.50	17.30	19.70	24.00	29 70	30.00

C-1315 Bottles—Narrow Mouth Of best American **green** glass, for cork stoppers

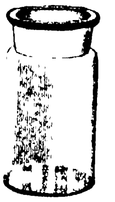
No.	A	B	C	D	E	F	G
Capacity	8 oz	16 oz	32	48	64 oz	1 gal	2 gal
For cork No.	5	6	8	9	10	11	14
No in orig case	216	144	96	48	48	36	12
Per dozen	1.05	1.50	2.25	2 75	3.60	6.00	15.00

C-1320 Bottles—Narrow Mouth Of best American **amber** glass, for cork stoppers

No.	A	B	C	D	E	F	G	H	I
Capacity, oz	1	2	4	6	8	16	24	32	48
For cork No	2	3	4	4	5	6	8	7	8
No in original case	864	720	432	360	288	144	120	96	48
Per dozen	.55	.60	.80	.90	1 10	1.50	1.95	2.40	2.47
Per gross in original case	6.00	6.50	9.00	10.00	12.00	17.00	21.50	26.00	30.00



C 1335



C 1355

C 1370

C-1325 Bottles—Flint glass Tall and narrow in shape, designed for samples of oil and other liquids

No.	A	B	C	D
Capacity, oz	1	2	4	8
Per dozen	70	1 35	1 50	2 60

C-1335 Bottles—Wide Mouth Of best American **flint** glass, for cork stoppers

No.	A	B	C	D	E	F	G	H	I	J	K
Capacity, oz	½	1	2	3	4	6	8	12	16	24	32
For cork No	8	9	10	15	15	16	17	17	24	22	2¼
No in original case	864	864	720	576	432	360	288	216	144	120	96
Per dozen	.60	.65	70	.85	1.00	1 10	1.25	1.65	1.90	2.55	2 75
Per gross in orig case	6 40	6.90	7 60	9.25	10.70	12.00	13.75	18.00	20.00	27.50	30.00

C-1340 Bottles—Wide Mouth —Of **green** glass, for cork stoppers

No.	A	B	C	D	E	F
Capacity	8 oz	16 oz	32 oz	64 oz	1 gal	2 gal
For cork No	13	20	20	2⅛ in	2⅜ in	2⅝ in
No in orig case	216	144	96	48	36	12
Per dozen	1.30	1.60	2.40	3.65	6.00	15.00

C-1355 Bottles—Extra Wide Mouth —Of best American **flint** glass, with narrow shoulder, for cork stoppers

No.	A	B	C	D
Capacity, oz	2	3	4	6
For cork No	10	14	22	18
Per dozen	.90	1.00	1.30	1.30

C-1370 Bottles—Narrow Mouth Of **flint** glass, with flat, vertical glass stopper

No.	A	B	C	D	E	F	G	H	I	J	K
Capacity, oz	½	1	2	3	4	6	8	12	16	32	64
No in original case	864	720	720	576	432	360	288	144	144	72	48
Per dozen	1.60	1.75	1.80	1.95	2.20	2.60	2.75	3.60	3.75	5.20	8.50
Per gross in orig. case	17.00	18.50	20.00	21.75	24.50	28.50	30.00	37.50	42.00	58.50	91.00

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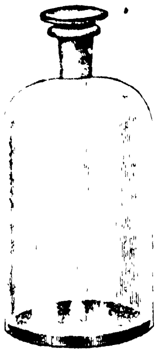
C-1385 Bottles—Narrow Mouth Of **green** glass, with flat, vertical glass stopper, especially intended for acids

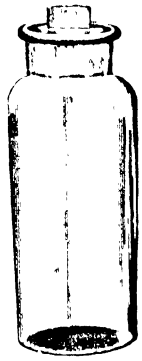
No.	A	B	C
Capacity ..	8 oz	16 oz	32 oz
No in orig case	144	144	96
Per dozen ...	3 00	3 75	5 10

No	D	E	F
Capacity	64 oz	1 gal	2 gal
No in orig case	48	36	12
Per dozen	8 40	11.40	24 00



C-1390

C-1395



C 1400

C-1390 Bottles—Narrow Mouth Of **flint** glass, with flat glass stopper, turned in a wet wooden mold which imparts a high luster to the outside surface, particularly recommended for use as laboratory reagent bottles

No	A	B	C	D	E	F
Capacity, oz	1	2	4	8	16	32
No in original case .	864	720	432	288	144	72
Per dozen	2 40	2 70	3 00	4 00	6 00	8 00
Per gross in case	24.50	27 00	33.00	40 00	65.00	77 00

C-1395 Bottles—Narrow Mouth Of **flint** glass, with high-ground, mushroom, glass stopper, has a fine, fire-polished finish, approaching shop furniture ware in appearance and much superior to iron mold finish, recommended especially for laboratory or other uses where a bottle of better appearance is desired

No.	A	B	C	D	E	F
Capacity, oz	½	1	2	3	4	6
No in original case ..	864	720	720	576	432	360
Per dozen	1.60	1.80	2.00	2.10	2.25	2 70
Per gross in orig case	17.00	19.00	21.00	22.50	25 00	30 00

No.	G	H	I	J	K
Capacity, oz	8	12	16	32	64
No in original case	288	144	144	96	12
Per dozen	3 00	3.60	4.10	5.75	9.60
Per gross in orig case.	33.00	39.50	45.00	63.00	....

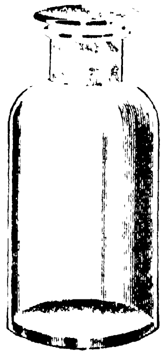
No.	L	M	N
Capacity, gal	1	2	3
No in original case . . .	12	6	3
Per dozen...	.22.40	46.50	72.00

Prices subject to change without notice

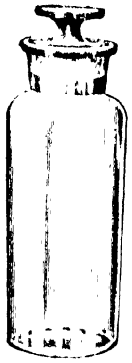
C-1400 Bottles—Wide Mouth Of **flint** glass, with **flat, vertical** glass stopper

No.	A	B	C	D	E
Capacity, oz	½	1	2	3	4
No in original case.	864	720	720	756	432
Per dozen	1 70	1 85	1.90	2.00	2.25
Per gross in original case	18 00	19 50	21 00	22.50	25.50

No.	F	G	H	I	J
Capacity, oz	6	8	12	16	32
No in orig case	360	288	144	144	72
Per dozen	2 75	2.90	3.50	3.80	5.60
Per gross in original case	29 50	31 00	38 00	42.00	61.50



C 1415



C 1420

C-1415 Bottles—Wide Mouth Of **flint** glass, with **flat glass** stopper, very carefully ground

No.	A	B	C	D	E	F
Capacity, oz	1	2	4	8	16	32
No in original case .	864	720	432	288	144	72
Per dozen	2 40	2 50	3 20	3 75	5.10	7.20
Per gross in orig case	26 50	28 00	35 00	41 00	56.00	80.00

C-1420 Bottles — Wide Mouth Of **flint** glass, **with high** ground-glass stopper, same quality **as** No **C-1415.**

No.	A	B	C	D	E	F
Capacity, oz	½	1	2	3	4	6
No in original case .	864	720	720	576	432	360
Per dozen	1.70	1.85	1.90	2.00	2.25	2.75
Per gross in orig case.	18.00	19.50	21.00	22.50	25.00	29.50

No.	G	H	I	J	K
Capacity, oz	8	12	16	32	64
No in original case	288	144	144	72	48
Per dozen	2.90	3 50	3.80	5.60	8.60
Per gross in orig case.	31 00	38.00	42.00	61.50	.....

No.	L	M	N
Capacity, gal	1	2	3
No in original case .	12	6	4
Per dozen .	27.50	52.00	110 00

C-1425 Bottles—Extra Wide Mouth Of **flint** glass, with **flat,** glass stopper

No.	A	B	C	D
Capacity, oz .	2	3	4	6
Per dozen	.95	1.05	1.40	1.50
Per gross	9.60	10.50	14.00	15.60

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REAGENT BOTTLE

Bottles—Reagent The reagent bottles offered below have ground-glass labels, blown in the glass, the surface of each letter being so ground as to render it distinct. The lettering is thus indestructible and in no danger of being defaced when the bottle is washed or handled, and the inconvenience and unsightly appearance attending the use of paper labels is entirely avoided. These bottles are made of glass containing no lead, zinc or other metallic flux and are unequalled as regards their convenient shape, thin dropping lip and perfect stoppering. They are exclusively used in many of the leading laboratories of the United States. The list of labels available in the various sizes will be submitted upon application.

C-1430 **Bottles—Reagent** Narrow mouth, capacity, 1 oz., height, $3\frac{5}{8}$ in.

Each	.20
Per dozen	2 00

C-1435 **Bottles—Reagent** Narrow mouth, capacity, 4 oz., height, $5\frac{1}{4}$ in.

Each	.29
Per dozen	2 95

C-1440 **Bottles—Reagent** Narrow mouth, capacity, 8 oz., height, $6\frac{1}{2}$ in.

Each	35
Per dozen	3 60

C-1445 **Bottles—Reagent** Narrow mouth, capacity, 16 oz., height, $7\frac{3}{4}$ in.

Each	50
Per dozen	5 20

C-1450 **Bottles—Reagent** Narrow mouth, capacity, 32 oz., height, $9\frac{1}{2}$ in.

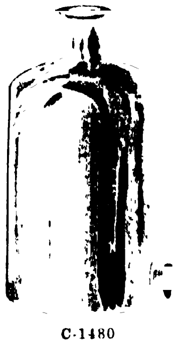
Each	.75
Per dozen.	7 50

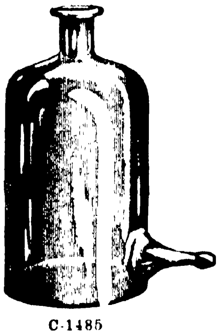
C-1455 **Bottles—Reagent** -Wide mouth, capacity, 1 oz., height, $3\frac{1}{8}$ in.

Each	20
Per dozen	2 00

C-1460 **Bottles—Reagent** -Wide mouth, capacity, 4 oz., height, $4\frac{7}{8}$ in.

Each	30
Per dozen	3 25


C-1480


C-1485

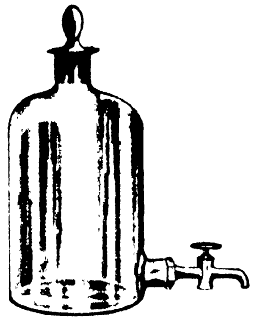
C-1480 **Bottles—Aspirator**—Of heavy, white glass; with outlet near bottom.

No.	B	C	D	E
Capacity, cc	500	1000	2000	4000
Each	1.00	1.60	2.00	3.20

C-1485 **Bottles—Aspirator**—Of heavy, white glass, with outlet tube near bottom, formed into nipple for attaching rubber tubing.

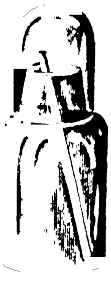
No.	B	C	D	E	F
Capacity, cc	250	500	1000	2000	4000
Each	.95	1.40	2.10	2.50	3.75

Prices subject to change without notice


C 1490

C-1490 **Bottles—Aspirator**—With ground-glass stopper and glass stopcock, ground into outlet near bottom.

No.	B	C	D	E
Capacity, cc	500	1000	2000	4000
Each	4.20	4.80	5.40	7.50


C-1500

C-1510

C-1500 **Bottles—Balsam** Having wide mouth with loose glass rod and glass cap, capacity, 60 cc.

Each	.30

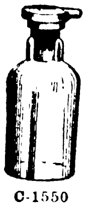
C-1510 **Bottles—Oil Immersion, B. & L.**—With metal cap.

Each	1.50

C-1535 **Bottles—Dropping** With ground-in pipette, delivery may be controlled by finger or by use or a rubber bulb.

No.	A	B	C
Capacity, cc	15	30	50
Each	.24	.26	.29

C-1540


C-1550

C-1540 **Bottles—Dropping**—Same as **No. C-1535**, but provided with rubber bulb.

No.	A	B	C
Capacity, cc	15	30	50
Each	.27	.29	.32

C-1550 **Bottles—Dropping**—TK type with stopper grooved to deliver contents drop by drop or hermetically seal bottle; with flat stopper protecting the lip of bottle from dust.

No.	A	B	C	D	E
Capacity, cc	15	30	50	100	200
Each	.23	.23	.33	.40	.50

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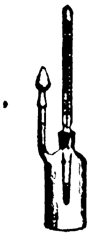

C-1605

C 1620

C-1605 Bottles—Specific Gravity With thermometer ground into neck and with side capillary tube with ground-on cap

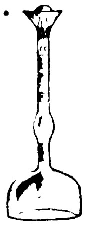
No	A	B	C
Capacity, cc	25	50	100
Each	4.00	4.50	5.00

C-1620 Bottles—Specific Gravity—Gay-Lussac's With perforated stopper, accurately adjusted

No.	A	B	C	D	E	F
Capacity cc	1	2	5	10	25	50
Each	1.60	1.75	1.90	2.00	2.20	2.40

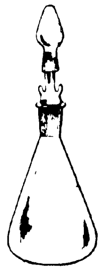
C-1625 Bottles—Specific Gravity—Gay-Lussac's With perforated stopper, unadjusted

No	A	B	C	D	E	F
Capacity, cc	1	2	5	10	25	50
Each	.80	80	.80	.90	1.00	1.15


C 1635

C-1680

C-1685


C-1690

C-1635 Bottle, Specific Gravity—Le Chatelier's New form, to accord with the requirements of the U S Bureau of Standards, as used for testing cements Without certificate

Each	6.00

C-1680 Bottles—Specific Gravity,—Squibb's.

No.	A	B	C
Capacity, cc	25	50	100
Each	1.25	1.50	2.00

C-1685 Bottle—Specific Gravity—Walker's—For very fluid liquids, capacity 20 cc

Each	2.50

C-1690 Bottle—Specific Gravity—Walker's—For viscous liquids, capacity 30 cc

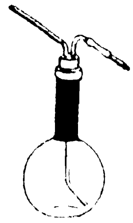
Each	2.25

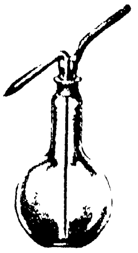
(Can also be supplied in 25 and 50 cc sizes)

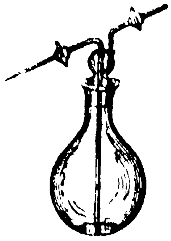
C-1700 Bottles — Washing — Faraday's—With rubber stopper and glass tubes, outlet tube having rubber joint to give flexibility

No.	B	D	E	F	G
Capacity, cc	250	500	750	1000	2000
Each	.30	.45	.60	.70	.90

Prices subject to change without notice


C 1710


C 1715


C 1720

C-1710 Bottles—Washing Of Pyrex glass, stopper and tubes same as **No. C 1700**, but neck covered with wicker for convenient use with hot fluids

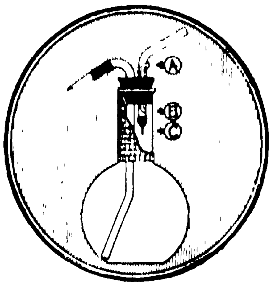
No.	B	C	D	E
Capacity cc	250	500	700	1000
Each	.80	1.10	1.20	1.25

C-1715 Bottles—Washing With glass tubes and glass stopper ground in, designed for use with volatile liquids

No	B	C	D
Capacity, cc	250	500	1000
Each	.75	1.00	1.20

C-1720 Bottles—Washing With glass tubes, stopcocks and glass stopper ground in

No	A	B	C	D
Capacity, cc	125	250	500	1000
Each	4.50	4.75	5.00	5.25

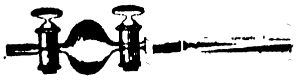


C-1723

C-1723 Bottles—Washing—Spencer's—Having special inner tube with Bunsen valve by which a continuous stream of water may be maintained, by removing thumb from "A" the stream is instantly stopped through the elimination of pressure, with flexible outlet and wicker wound around neck

No.	A	B	D	E
Capacity, cc	250	500	1000	2000
Each	1.50	1.75	2.00	2.30

C-1745


C-1785

C-1745 Bottles—Weighing—High form, with ground-glass stopper, very light

No.	A	D	F	H
Height, mm	50	65	75	80
Diameter, mm	15	15	22	15
Each	.27	.30	.40	.30
No.	**I**	**K**	**L**	
Height, mm	90	100	100	
Diameter, mm	18	25	40	
Each	.45	.52	.75	

C-1785 Bottles—Weighing—Lunge's—With ground-in stopper with bulb and two glass stopcocks, for weighing corrosive liquids, capacity, about 15 cc.

Each	4.00

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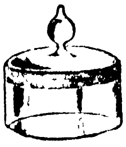


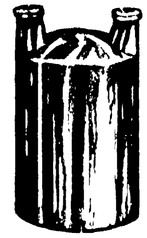
C 1755 60

C-1755 Bottles—Weighing Low form, with ground-glass stopper

No	A	B	C	D	E	G
Height, mm	40	50	50	50	60	70
Diameter, mm	25	25	30	40	30	35
Each	.33	36	.40	.52	.46	.52

C-1760 Bottles—Weighing Low form, with ground glass stopper

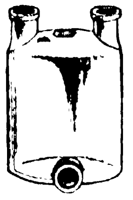
No	A	B	C
Height, mm	30	30	30
Diameter mm	50	60	70
Each	1 30	1 65	1 95



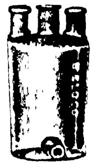
C 1790

C-1790 Bottles—Woulff's Of heavy glass, with two necks

No.	B	C	D	E	F
Capacity, cc	250	500	1000	2000	4000
Each	2.50	2.75	3.50	4.50	6 00



C-1800



C 1805

C-1795 Bottles—Woulff's Of heavy glass, with three necks

No.	B	C	D	E	F
Capacity, cc	250	500	1000	2000	4000
Each	2.50	2.75	3.50	4.50	6 00

C-1800 Bottles—Woulff's Of heavy glass, with two necks and tubulature near bottom

No	A	B	C	D
Capacity, cc	500	1000	2000	4000
Each	3.50	4.50	6.00	8.00

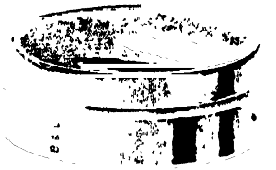
C-1805 Bottles—Woulff's Of heavy glass, with three necks and tubulature near bottom

No.	A	B	C	D
Capacity, cc	500	1000	2000	4000
Each	3 50	4.50	6.00	8 00

C-11015 Bottle Washer—A small faucet attachment, the use of which is not at all limited to bottles but will be found equally serviceable for cleaning test tubes and flasks, etc The jet of water is turned off and on instantly by a turn of the brass outlet tube.

Each 1.50

Prices subject to change without notice

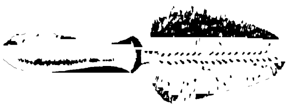


C 11025

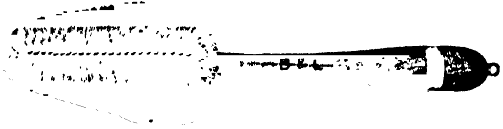
C-11025 Boxes—Tin Seamless

No.	A	B	C	D
Capacity, gm	5	10	15	30
Per gross	1 20	1.50	1.80	2 40

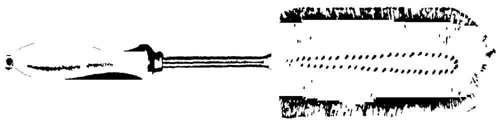
No.	E	F	G
Capacity, gm	60	125	250
Per gross	3.90	5 75	8 20



C-11040



C-11045



C-11050

C-11040 Brushes—Bristle With wooden handle, for cleaning small cylinders, etc

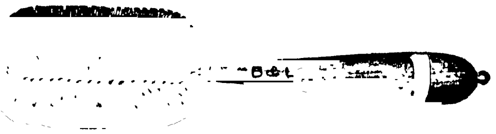
Each	.30
Per dozen	3.15

C-11045 Brushes—Bristle With wooden handle, for cleaning large cylinders

No.	A	B
Number of rows	3	4
Each	28	.35
Per dozen	2.85	3.65

C-11050 Brushes—Bristle With wooden handle, for cleaning small jars

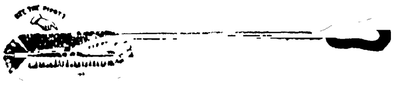
Each	.25
Per dozen	2 70



C-11055

C-11055 Brushes—Bristle—With wooden handle, for cleaning large jars

No.	A	B	C
Number of rows	3	4	6
Each	.40	.43	.45
Per dozen	4.40	4.70	4.95



C-11065

C-11065 Brushes—Bottle, Pivoted—With tufted end; length, 12 in., by means of pivot attaching body of brush to handle, the brush always presents a firm and complete surface to inside of bottle.

Each .... .16
Per dozen 1.70

Continued on Next Page

C-11070 Brushes—Flask—With pliable end, which adapts itself to curvature of flask, facilitating thorough cleaning

Each	.30

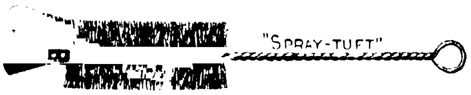
C-11085 Brushes—Camel's Hair Miniature size, bound in quill handle

No.	A	B	C	D
Numbers	1	2	3	4
Length of hair, mm	8	10	12	14
Per dozen				
Per gross	1 30	1 50	2 00	2 25

No.	E	F	G	H
Numbers	5	6	7	8
Length of hair, mm	16	18	20	22
Per dozen				
Per gross	3 00	3 50	4 00	4 50

C-11090 Brushes—Camel's Hair Flat, for dusting scale pans

No	A	B	C	D
Width, mm	12	25	37	50
Each	22	.32	42	62
Per dozen	2 50	3 40	4.55	6.80



C 11112 27

C-11112 Brushes—Test Tube—Spray-Tuft A new type of brush of unusual efficiency which leaves no space in the tube untouched, prevents breakage of tubes, as well as unbroken mass of bristle on the bottom and sides of tube, on brass wire

Each	08
Per dozen	80
Per gross	9 25

C-11120 Brushes—Test Tube On tinned iron wire, bristle

Each	04
Per dozen	35
Per gross	3 40

C-11125 Brushes—Test Tube—On tinned iron wire, bristle with bristle end

Each	07
Per dozen	70
Per gross	7 25

C-11127 Brushes—Test Tube—Spray-Tuft Same as No **C-11112**, but on tinned iron ware

Each	07
Per dozen	.70
Per gross	7 25

C-11130 Brushes—Test Tube On tinned iron wire, bristle, with sponge end

Each	07
Per dozen	70
Per gross	7.25

C-11145 Brush—Tube—For cleaning narrow tubes, bristle, on tinned iron wire

Each	05
Per dozen	.26
Per gross	2.90

C-11150 Brushes—Tube—For cleaning burettes, bristle, on tinned iron wire one meter long

Each	.12
Per dozen	1.25
Per gross	13.60

C-11160 Brushes—Tube—For cleaning cylinders, large tubes, bottles, etc, bristle, on brass wire

No.	A	B	C	D
Length, mm	250	300	375	500
Each	1.15	1.25	1.45	1.80
Per gross	13.20	14.45	17.00	21.30

BURETTES

C-1840

C 1845

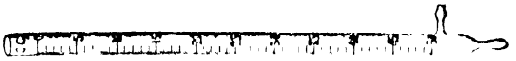
C-1840 Burettes—Mohr's Without fittings, for pinchcock

No	D	G	K
Capacity, cc	25	50	100
Graduated cc	1 10	1 10	1 5
Each	30	.42	.72

C-1845 Burettes—Mohr's Precision Graduated to meet the specifications of the U S Bureau of Standards, adjusted at a temperature of 20°C for pinchcock, without fittings

No.	A	B
Capacity cc	10	25
Graduated, cc	1 20	1 10
Each	4 50	5.00

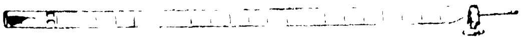
No	C	D
Capacity, cc	50	100
Graduated cc	1 10	1/5
Each	6.80	8.00



C 1850

C-1850 Burettes—Mohr's With side tube for refilling, for pinchcock, without fittings

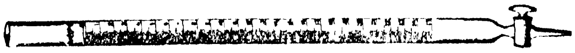
No.	C	E	H
Capacity, cc	25	50	100
Graduated, cc	1/10	1/10	1/5
Each	.36	.55	.80



C-1855

C-1855 Burettes — Mohr's — With Geissler's stopcock, straight

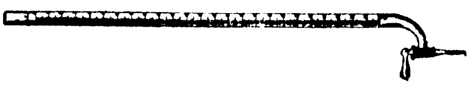
No.	C	F	J
Capacity, cc	25	50	100
Graduated, cc	1/10	1/10	1/5
Each	1.05	1 15	1.50



C-1860

C-1860 Burettes—Mohr's Precision—Graduated to meet the specifications of the U S Bureau of Standards, with Geissler's glass stopcock, straight

No.	A	B	C	D
Capacity, cc	10	25	50	100
Graduated, cc	1/20	1/10	1/10	1/5
Each	7.20	9.75	10.50	11.50



C-1875

C-1875 Burettes—Mohr's—With Freseniu's' glass stopcock; bent

No.	C	E	H
Capacity, cc	25	50	100
Graduated, cc	1/10	1/10	1/5
Each	1.30	1.45	1.90

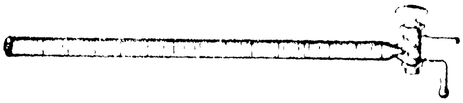
Prices subject to change without notice

Continued on Next Page

C 1880

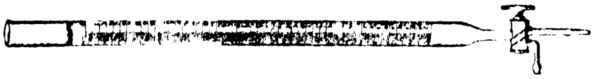
C-1880 Burettes—Mohr's Precision Graduated to meet the specifications of the U S Bureau of Standards, with Fresenius' glass stopcock, bent

	No	A	B	C	D
Capacity cc		10	25	50	100
Graduated cc		1/20	1/10	1/10	1/5
Each . ..		8 00	10 50	11 50	12 25


C 1890

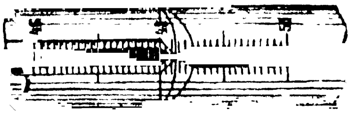
C-1890 Burettes With patent, three way, glass stopcock

	No.	A	B	E
Capacity cc .		25	50	100
Graduated cc		1/10	1/10	1/10
Each		1 95	2 40	3 15


C 1895

C 1895 Burettes—Mohr's Precision Graduated to meet the specifications of the U S Bureau of Standards, with three way, glass stopcock

	No.	A	B	C	D
Capacity, cc .		10	25	50	100
Graduated cc		1/20	1/10	1/10	1/5
Each . .		9.25	11 75	12.75	13 50


C 1915 20-30

C-1915 Burettes—Schellbach's With dark blue stripe on white enameled background, for accurate reading of the meniscus, for pinchcock, without fittings

	No.	A	B	C	D
Capacity, cc .		25	50	75	100
Graduated, cc		1/10	1/10	1/10	1/5
Each . .		1.60	1.80	2 25	2.50

C-1920 Burettes—Schellbach's—With dark blue stripe on white enameled background, for pinchcock, with side tube for refilling Without fittings

	No.	A	B	C	D
Capacity, cc		25	50	75	100
Graduated, cc .		1/10	1/10	1/10	1/5
Each . .		1 75	2.00	2.50	2.75

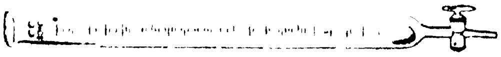
C-1925 Burettes—Schellbach's—With dark blue stripe on white enameled background, as above, with Geissler's stopcock, straight

	No.	A	B	C	D
Capacity, cc . .		25	50	75	100
Graduated, cc . .		1/10	1/10	1/10	1/5
Each		2.75	3.20	3.50	3.75

C-1930 Burettes—Schellbach's—With dark blue stripe on white enameled background, with patent, three-way, glass stopcock, as shown in illustration No **C-1890.**

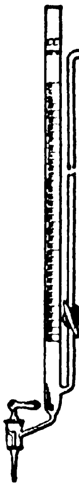
	No.	A	B	C	D
Capacity, cc		25	50	75	100
Graduated, cc		1/10	1/10	1/10	1/5
Each		3.50	3.80	4.00	4.20

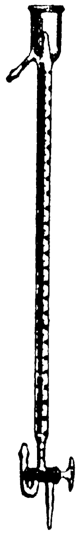
Prices subject to change without notice

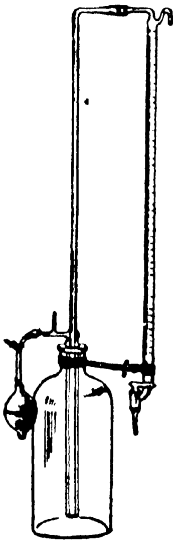

C 1945

C-1945 Burettes—Dispensing—Wide form, with glass stopcock, straight

	No.	A	B	C	D
Capacity, cc . . .			250	500	1000
Graduated, cc .			1	2	5
Each			2 10	2 70	3 60


C 1965


C-1970


C-1975

C-1965 Burettes—Gawalowsky's—With side tube and ground stopcock to connect with reservoir for refilling

	No.	A	B	D
Capacity, cc		25	50	100
Graduated, cc		1/10	1/10	1/5
Each		2 50	2.75	3.50

C-1970 Burrettes — Automatic With three-way stopcock, zero point and overflow cup, with dark blue, enameled stripe on white background for accurate reading of the meniscus

	No.	A	B	D
Capacity, cc		25	50	100
Graduated, cc .		1/10	1/10	1/5
Each		5.50	6.00	6.50

C-1975 Burettes—Automatic Zero, Squibb's—Latest form, filled by pressure from rubber bulb, all joints ground air-tight, with dark blue stripe on white enameled background for accurate reading, price includes complete apparatus, with bulbs, reservoir, clamp and burette

	No.	A	B
Capacity, cc		25	50
Graduated, cc		1/10	1/10
Each		8.50	9.00

C-2010 Burette Attachments—For use on burettes without stopcocks, consist of pinchcock, glass tip and rubber tubing to connect with burette

	No.	A	B	C
Size		Small	Medium	Large
Each		.25	.25	.30

C-2020 Burette Tips—Of glass, for Attachment No. **C-2010.**

Each	.05
Per dozen	.50

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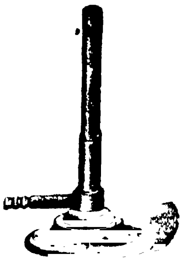
BURNERS



C 11305

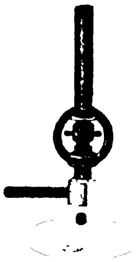
C-11318

C-11320

C-11305 **Burners—Bunsen's** Usual size, with air regulator
Each 40

C-11318 **Burners—Tirrill Type** With adjustments for air and gas
Each 1 70

C-11320 **Burners—Bunsen's Adjustable** Readily adjustable for gas and air, a desirable burner for universal use
Each 1.35

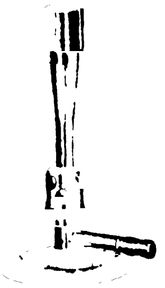


C-11330

C-11335

C-11330 **Burners — Bunsen's Combination** — Adjustable for coal or gasoline gas, with regulators for air and gas, height, 7 in
Each 1.70

C-11335 **Burners — Bunsen's Combination** — Same as No C-11330 above, but without base, for screwing into gas pipes
Each 1.50



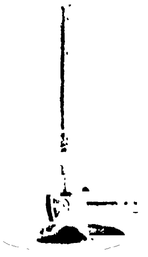
C-11290

C-11290 **Burners—High Temperature, Meker's**—With nickel grids; only the sizes in general use here listed, other shapes, blast burners, etc ; quoted upon request. Can likewise be supplied for Natural or Gasoline Gas.

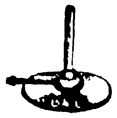
For Artificial Gas:

No.	A	B	C
Height, mm	115	130	155
Diameter of flame, mm	16	20	24
Each	2.00	2.20	2.75

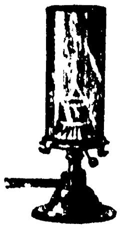
Prices subject to change without notice



C 11390



C 11420



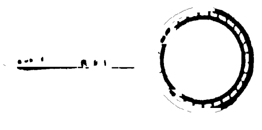
C-11395

C-11390 **Burners—Bunsen's** With pilot flame
Each 2.10

C-11395 **Burners—Argand** Low form, with glass chimney, 7 in high, flame is adjustable and can be burned very low
Each 1.45

C-11420 **Burners—Bunsen's Micro** Permits a very small flame to be obtained, nickel plated, height, 60 mm, without mica chimney
Each . . .. .85

C-11430



C-11525

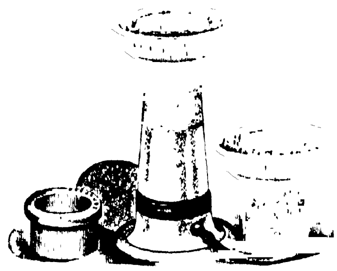
C-11430 **Burners—Bunsen's**—Low form, with air regulator
Each 60

C-11450 **Burners—Illuminating** Height, 200 mm
Each 1.45

C-11455 **Burners—Illuminating**—Height, 300 mm
Each 2.10

C-11525 **Burners—Bunsen's Ring Form** For use on apparatus support for heating funnels, flasks, etc , with air regulator

No	A	B	C	D
Diameter of rings, mm	75	100	125	150
Each	1 70	1.80	2.05	2.30



C-11535

C-11535 **Burners—Chaddock's Non-corrodible**—Will be appreciated by every chemist who has used metal burners in hoods, as it is incorrodible, the gas exit being of glass and the rest of porcelain and white fire clay, consists of three sections serving for various laboratory requirements, and is supplied with flame spreader, asbestos disc and asbestos rings; small chimney is for platinum triangles
Each ....Net 4.00

Separate Parts for No. C-11535:

Towers, each ....Net .50
Rings, each ....Net .20

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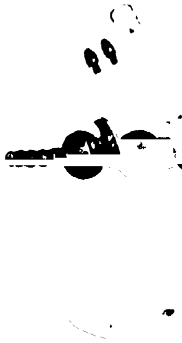
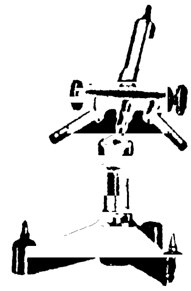


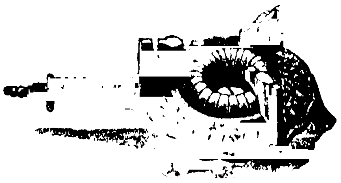
C 11250



C 11255

C-11250 Burners—Blast Lamps—Bunsen's For gas, adjustable, with separate stopcocks and controlling air and gas, improved form with movable sleeve and three tips
Each 4 70

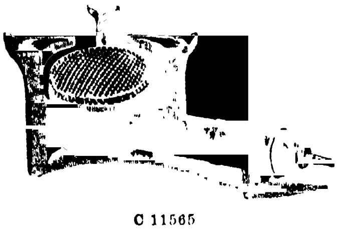
C-11255 Burners—Blast, Massachusetts Institute of Technology pattern Readily detachable from stand for use as hand blowpipe, mounted on ball socket, set of three gas nipples and two sleeves, needle valves afford easy and accurate regulation of both gas and air supply
Each 6 75



C-11555

C-11555 Burners—Fletcher's Radial—Made of annealed cast-iron and very strong, works equally well with coal or water gas, producing practically solid flame, which does not run to a point in the center

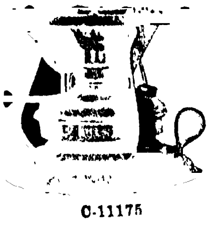
No.	A	B
Diameter of burner ring, mm	90	125
Each	3.40	5.25



C 11565

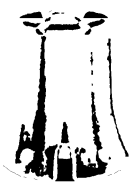
C-11565 Burners—Fletcher's Solid Flame—For large pans and quick boiling

Size	A	B
Diameter, mm	75	100
Each	2.20	2.70



C-11175

C-11175 Burners—Alcohol Stove—For denatured alcohol, of nickel-plated brass and readily adjustable, giving intensely hot flame; diameter, 6⅛ in; height over-all 5½ in
Each 4.70



C 11500

C 11460

C-11460 Burner Tips—Wing top, for bending glass tubing

Size	A	B
For burners of	7/16"	1/2" diameter
Each	.12	.16

C-11500 Burner Guards—Vitrified Earthenware—For protecting the flame from draughts, can also be used as a support, height, 9 in, bottom, 8 in top, 5 in
Each .. .... .50

C 2050

C 2055

C-2060

C-2050 Calcium Chloride Cylinders Narrow mouth On foot, with tubulature near bottom

No.	A	B	C
Height, mm	210	260	315
Diameter, mm	25	40	45
Each	1.45	1.75	2.20

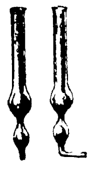
C-2055 Calcium Chloride Cylinders—Wide mouth On foot, with tubulature near bottom

No.	A	B	C
Height, mm	210	260	315
Diameter, mm	25	40	45
Each	1.45	1.75	2.20

C-2060 Calcium Chloride Cylinders—Narrow mouth, with perforated ground glass stopper and side tube near top, on foot.

No.	A	B	C
Height, mm	210	260	315
Diameter, mm	25	40	45
Each	4.00	4.20	4.70

C-2065



C-2075-80

C-2065 Calcium Chloride Tubes—With one bulb; straight.

No.	A	C	D	E	F
Length, mm.	75	100	125	150	200
Each	.12	.13	.16	.17	.21

Continued on Next Page

C-2070 Calcium Chloride Tubes With one bulb, bent

No	A	B	C	D	E
Length, mm	75	100	125	150	200
Each	12	13	16	.17	.21

C 2075 Calcium Chloride Tubes With two bulbs, straight

No.	A	B	C	D	E
Length, mm	75	100	125	150	200
Each	.13	.15	17	.20	.24

C-2080 Calcium Chloride Tubes With two bulbs, bent

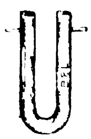
No.	A	B	C	D	E
Length, mm	75	100	125	150	200
Each	.13	.15	.17	.20	.24

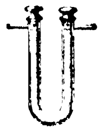
C-2085 Calcium Chloride Tubes With two bulbs, and small, inner tubes to collect moisture

No.	A	B	C	D	E
Length, mm	75	100	125	150	200
Each	24	.26	.32	.34	43

N B – The length of Calcium Chloride Tubes Nos C-2065, -70, -75, -80, -85, is measured from the mouth to the bottom of the lower bulb

C-2090


C-2100


C 2125

C-2090 Calcium Chloride Tubes U-shaped

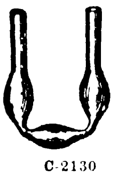
No.	A	B	C	D
Length, mm	75	100	125	150
Each	14	15	19	23

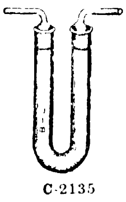
C-2100 Calcium Chloride Tubes U-shaped, with two side tubes

No	A	B	C	E
Length, mm	100	125	150	200
Each	.23	.30	38	.60

C-2125 Calcium Chloride Tubes — Schwartz's With side tubes and perforated glass stoppers

No.	A	B	C	D	E
Length, mm	100	125	150	175	200
Each	78	.85	96	1 20	1.50


C-2130


C-2135

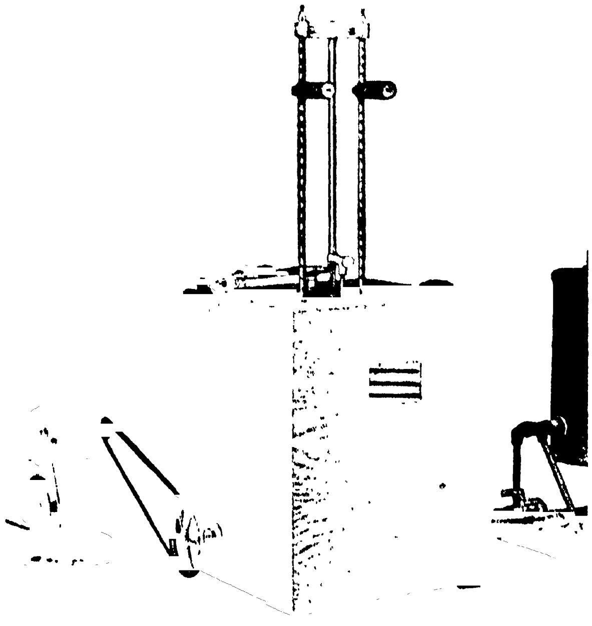
C-2130 Calcium Chloride Tubes With ground-in, outlet tubes

No.	A	B	C
Length, mm	100	125	150
Each	.80	.90	1.05

C-2135 Calcium Chloride Tubes — Pelligot's — With three bulbs

No.	A	B	C	D	E
Length, mm	100	125	150	175	200
Each	.52	.65	.85	1.05	1.30

CALORIMETERS


C-251

C-251 Calorimeters — Parr's New Adiabatic This calorimeter is equipped with bomb of Illium alloy, insoluble in nitric and sulfuric acids and of especially high tensile strength The operation is free from complicated details and the temperature of the jacket water is maintained at the same stage as that of the inner system so that the water surrounding the bomb neither loses nor gains heat throughout the determination This is effected by the accurate control of hot and cold water sources and the distribution of the incoming water by means of an unusually efficient stirring device Temperature lag is reduced to a minimum, the water circulating on all sides of the calorimeter space, top as well as sides and bottom, by means of a small rotary pump

Calorimeter without motor or thermometers

Each .... .Net 400 00

C-252 Motor for use with the above of Universal type for 110 or 220 volts

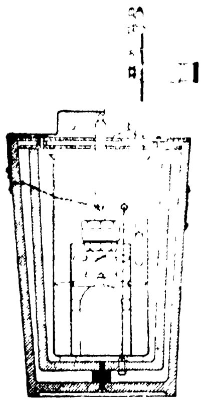
Each . .. . . . Net 30.00

C-253 Thermometer for use with the above, 65° to 90°C with B of S certificate

Each . . . . Net 12 00

C-254 Thermometer for use with the above, 65° to 105°C with B of S certificate

Each .... Net 15 00


C-255

C-255 Calorimeter — Parr Peroxide Bomb This calorimeter, using sodium peroxide as a combustion medium, has been very widely used where an inexpensive calorimeter is desired which does away with the necessity of maintaining a supply of oxygen gas Complete with measuring cup, standardized thermometer, 2000-cc graduated flask, 5" 100-mesh sieve, brush and sufficient chemical for 50 determinations.

Each ....Net 100.00

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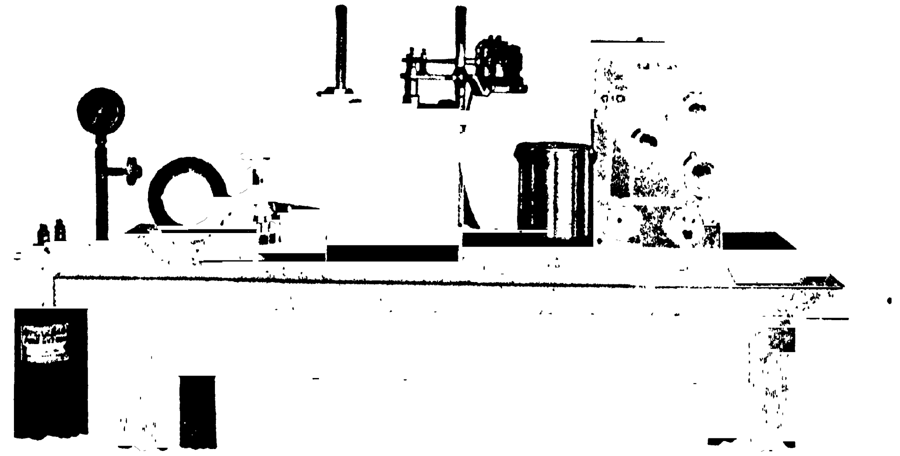


C 230

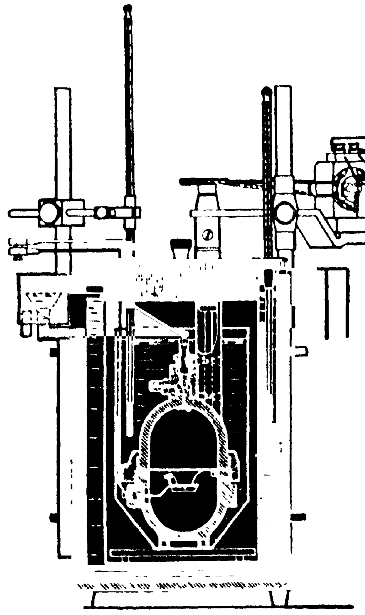
SINGLE VALVE BOMB WITH REGULAR JACKET

C-230 Calorimeter—Emerson Oxygen Bomb—Single valve, regular jacket bomb with spun nickel lining, calorimeter jacket double walled, oxygen piping for S S White (small) or Linde oxygen tanks, stirrer with motor, nickel fuel pan, thermometer holder, spanner, gaskets, etc Unless otherwise specified the double piping connections for S S White cylinders will be supplied
Each .... Net 245.00

C-232 Calorimeter—Emerson Oxygen Bomb—Same as above but with gold lined bomb
Each 350 00

C-235 Calorimeter—Emerson Oxygen Bomb Double valve type, particularly valuable where gaseous products of combustion are to be measured Same equipment as listed under No C-230 above
Each 255.00

C-237 Calorimeter—Emerson Oxygen Bomb—Same as No C-235 above but with gold lined bomb
Each 385.00



C-240

Prices subject to change without notice

C-240 Calorimeter—Emerson Oxygen Bomb, With Daniels' Adiabatic Jacket—Permits of test under ideal conditions, namely with calorimeter bucket surrounded by jacket of same temperature to minimize exchange of heat Temperature of jacket is carried along with temperature of calorimeter by passing electric current through jacket using the water as a resistor Cannot, therefore, be used on direct current. Eliminates the fragile character of vacuum wall cups and likewise the necessity of cooling corrections and radiation curve Complete with single valve steel bomb, nickel lined; calorimeter bucket, single or double oxygen piping (when not otherwise specified the double piping for S S White cylinders will be supplied); stirring device with motor, spanner wrench, thermometer reader, gaskets, etc
Each 285.00

C-242 Calorimeter—Emerson Oxygen Bomb, with Daniels' Adiabatic Jacket—Same as No C-240 above but with double valve type bomb, nickel lined
Each . .. .Net 295.00

C-244 Calorimeter—Emerson Oxygen Bomb, with Daniels' Adiabatic Jacket—Same as No C-240 above but with gold lined bomb
Each ....Net 405.00

Note Calorimeter thermometers not included in the above prices Adiabatic jacket cannot be used with direct current without use of rotary converter Descriptive literature on request.

C-248 Thermometer—Calorimeter—With U S Bureau of Standards certificate, range 18 to 30°C, graduated in 1/50°C
Each ....Net 42.50

C-250 Thermometer — Calorimeter — For Daniels' Jacket, range 15° to 35°C, graduated in 1/10°C.
Each ....Net 6.00

Note—Beckman Thermometers both with and without U. S Bureau of Standards certificate can be supplied. Prices on request.

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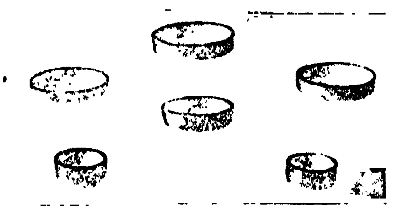


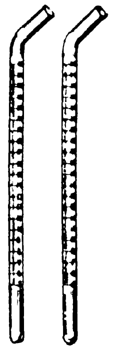
C-6010

C-6010 **Capsules—Vitreosil—Glazed** Especially adapted for ash determinations, ignitions, etc., are entirely resistant to acids and will withstand rapid changes of temperature without cracking

No.	A	B	C	D	E	F
Approximate capacity, cc.	10	15	20	30	35	40
Diameter inside, mm....	35	44	51	57	60	70
Depth in center inside, mm .	13	13	13	13	13	16
Each . ..	.85	.85	1 15	1 15	1 35	1 65

C 2200

C-2160



C 2165

C-2170

C-2160 **Carbon Tubes**—For **Eggertz'** color comparison test, for the estimation of carbon and manganese in steel, of superior quality, the tubes of each set bearing corresponding numbers so that they may be readily kept together

No.	A	B	C	D	E	G
Capacity, cc	10	25	30	50	50	100
Graduated, cc	1/10	1/10	1/10	1/10	1/5	1/5
Per set of 2 .	2 00	2.00	2.50	3 00	2.50	3 50
Per set of 4 .	4.50	4.50	5.50	6.60	5.50	7.70

C-2165 **Carbon Tubes—Julian's**—Same as No **C-2160** above, but with bent ends, permitting the mixing of the contents without the use of a stopper in the tube, lower portion of tube is ungraduated

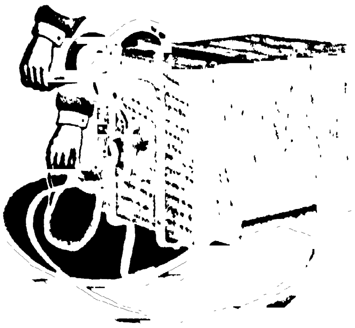
No.	A	B	C	D
Capacity, cc.............	0-50	5-30	10 50	10-70
Graduated, cc...........	1/10	1/10	1/10	1
Per set of 2	2.25	2 75	3.00	3 00
Per set of 4	5.00	6.00	6.60	6.60

C-2170 **Carbon Tubes**—Same as No **C-2160** above, but of test tube form, graduated

No.	A	B	C	D	E
Capacity, cc........	5	10	15	20	25
Graduated, cc......	1/10	1/10	1/10	1/10	1/10
Each	.24	.30	.36	.45	.50

C-2200 **Carbon Filter Tubes**—With stems ground to point.

No.	A	B	C	D	E
Diameter, mm	20	25	30	35	40
Each	.15	.20	.25	.35	40



C-11595

C-11595 **Carboy Inclinator — Flaherty's** A simple device, whereby a carboy is tilted and its contents poured out at will, with little exertion and without spilling or splashing, single movement of lever locks inclinator to the carboy; strongly built of iron with all cast parts malleable.

Each **10.00**

C-5535 40

C-5535 **Casseroles** Coors porcelain, glazed with exception of rim, with lip and flat porcelain handle

No	1	2	3	3a	4
Outside diam, mm	50	70	85	95	110
Inside diam, mm	47	66	80	90	105
Height, mm	25	35	45	50	62
Capacity, cc	30	75	150	210	375
Each	.42	.48	60	.84	1.08

No.	4a	5	6	7
Outside diam, mm	133	140	165	175
Inside diam, mm .	130	130	160	170
Height, mm.	68	88	95	130
Capacity, cc .	500	750	1250	2000
Each	1.38	1.68	2.40	4 20

C-5540 **Casseroles**—Ohio porcelain, with porcelain handle

No.	1	2	3	3a
Capacity, cc . .	30	75	150	210
Diameter over body, mm	50	70	85	95
Each	.35	.45	.50	.70

No.	4	5	6	7
Capacity, cc	375	750	1250	2000
Diameter over body, mm	110	135	165	175
Each	.85	1.55	1.95	3.35

C-5541 **Casseroles**—Coors porcelain, with extra long flat porcelain handle glazed inside and outside with exception of rim, size No 4, diameter, mm, 117; height, mm, 56, capacity, cc., 300.

Each 1.32

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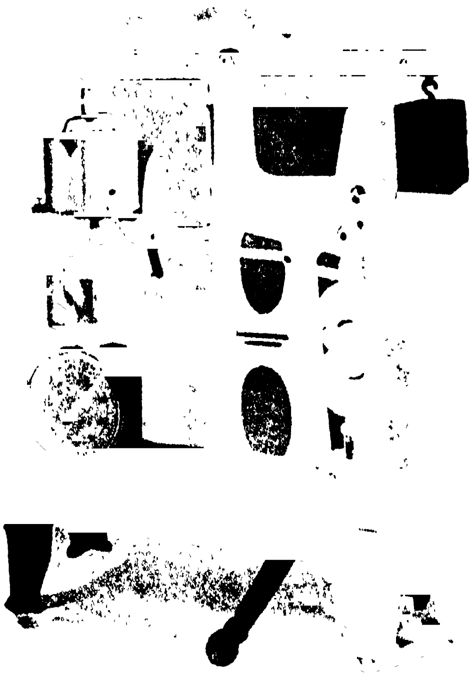
CEMENT TESTING EQUIPMENT



C 275

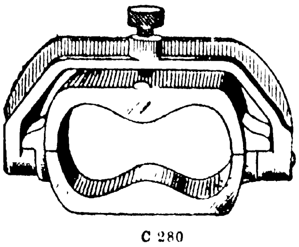
C-275 Cement Testing Machine—Olsen's Capacity 1000 pounds, of shot type, breaking load is weighed automatically on scale placed on frame of machine Very rapid in operation and supplied with latest type of A S C E standard roller clips

Each . . . . Net 225.00

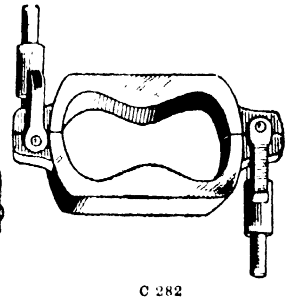
C-277 Cement Testing Machine—Olsen's—Same as above but of 2000 pound capacity

Each . . . . Net 335.00

Compression and transverse Testing Machines can be supplied. Prices on request.



C 280



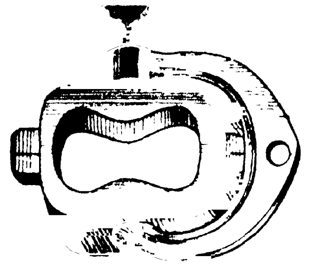
C 282

C-280 Cement Briquet Molds—Improved standard with means for separating sections automatically without tapping, according to specifications of A. S. T. M.

Each . . . . Net 4.50

C-282 Cement Briquet Molds—With end clamps according to specifications of A. S. T. M.

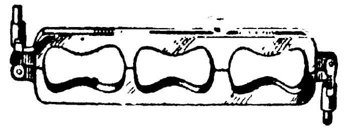
Each . . . . Net 4.50



C-284

C-284 Cement Briquet Molds Standard with "C" clamp

Each . . . . Net 4.50



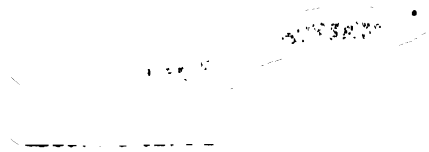
C-287

C-287 Cement Briquet Gang Molds Standard, with end and center clamps according to specifications of A S T M

No.	A	B	C	D	E
No in gang	2	3	4	5	6
Each . . . . Net	9.00	12.40	16.50	20.60	24.75

C-288 Cement Cube Molds These can be supplied with brass hinged clamp for one or two inch cube in gangs of one, two and three

Prices on application

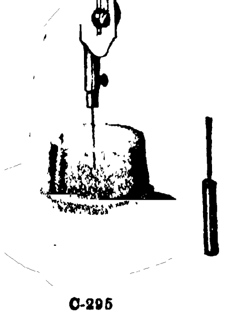


C-290

C-290 Cement Briquet Mold Brushes Of brass wire with wooden handle

Each . . . . Net 1.50

Cement Specific Gravity Bottles—See No **C-1635** Le-Chatelier specific gravity bottle.



C-295

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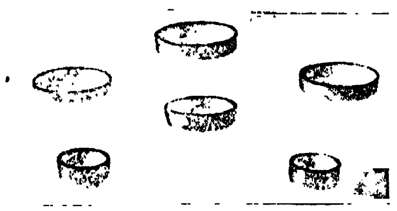


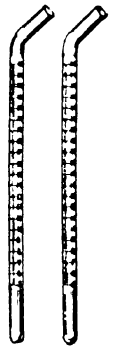
C-6010

C-6010 **Capsules—Vitreosil—Glazed** Especially adapted for ash determinations, ignitions, etc., are entirely resistant to acids and will withstand rapid changes of temperature without cracking

No.	A	B	C	D	E	F
Approximate capacity, cc.	10	15	20	30	35	40
Diameter inside, mm....	35	44	51	57	60	70
Depth in center inside, mm .	13	13	13	13	13	16
Each . ..	.85	.85	1 15	1 15	1 35	1 65

C 2200

C-2160



C 2165

C-2170

C-2160 **Carbon Tubes**—For **Eggertz'** color comparison test, for the estimation of carbon and manganese in steel, of superior quality, the tubes of each set bearing corresponding numbers so that they may be readily kept together

No.	A	B	C	D	E	G
Capacity, cc	10	25	30	50	50	100
Graduated, cc	1/10	1/10	1/10	1/10	1/5	1/5
Per set of 2 .	2 00	2.00	2.50	3 00	2.50	3 50
Per set of 4 .	4.50	4.50	5.50	6.60	5.50	7.70

C-2165 **Carbon Tubes—Julian's**—Same as No **C-2160** above, but with bent ends, permitting the mixing of the contents without the use of a stopper in the tube, lower portion of tube is ungraduated

No.	A	B	C	D
Capacity, cc	0-50	5-30	10 50	10-70
Graduated, cc	1/10	1/10	1/10	1
Per set of 2	2.25	2 75	3.00	3 00
Per set of 4	5.00	6.00	6.60	6.60

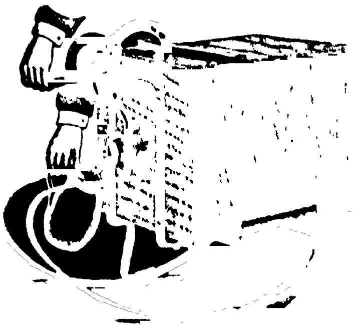
C-2170 **Carbon Tubes**—Same as No **C-2160** above, but of test tube form, graduated

No.	A	B	C	D	E
Capacity, cc	5	10	15	20	25
Graduated, cc	1/10	1/10	1/10	1/10	1/10
Each	.24	.30	.36	.45	.50

Prices subject to change without notice

C-2200 **Carbon Filter Tubes**—With stems ground to point.

No.	A	B	C	D	E
Diameter, mm	20	25	30	35	40
Each	.15	.20	.25	.35	40



C-11595

C-11595 **Carboy Inclinator — Flaherty's** A simple device, whereby a carboy is tilted and its contents poured out at will, with little exertion and without spilling or splashing, single movement of lever locks inclinator to the carboy; strongly built of iron with all cast parts malleable.

Each **10.00**

C-5535-40

C-5535 **Casseroles** Coors porcelain, glazed with exception of rim, with lip and flat porcelain handle

No	1	2	3	3a	4
Outside diam, mm	50	70	85	95	110
Inside diam, mm	47	66	80	90	105
Height, mm	25	35	45	50	62
Capacity, cc	30	75	150	210	375
Each	.42	.48	60	.84	1.08

No.	4a	5	6	7
Outside diam, mm	133	140	165	175
Inside diam, mm .	130	130	160	170
Height, mm.	68	88	95	130
Capacity, cc .	500	750	1250	2000
Each	1.38	1.68	2.40	4 20

C-5540 **Casseroles**—Ohio porcelain, with porcelain handle

No.	1	2	3	3a
Capacity, cc . .	30	75	150	210
Diameter over body, mm	50	70	85	95
Each	.35	.45	.50	.70

No.	4	5	6	7
Capacity, cc	375	750	1250	2000
Diameter over body, mm	110	135	165	175
Each	.85	1.55	1.95	3.35

C-5541 **Casseroles**—Coors porcelain, with extra long flat porcelain handle glazed inside and outside with exception of rim, size No 4, diameter, mm, 117; height, mm, 56, capacity, cc., 300.

Each 1.32

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270	Board of Health disc without tubes	Each	Net	17 50
280	5 in diam perforated bronze basket with copper drip can	Each	Net	34 00
290	11 in diameter perforated bronze basket with copper draining chamber	Each		50 00
302	15 cc metal tubes, Cornell style with rubber cushions	Each	Net	80
312	Reducing caps for 15 cc glass tubes in 50 cc metal tubes	Each	Net	22
313	Reducing caps for 25 cc glass tubes in 50 cc metal tubes	Each	Net	22
320	50 cc metal tubes, Cornell style with rubber cushions	Each	Net	.95
325	50 cc trunnion rings	Each	Net	.60
362	Babcock test trunnion cups with rubber pads	Each	Net	.90
363	Square trunnion cups for sputum bottles, No 585	Each	Net	2 25
368	Trunnion ring for metal tubes, No 369	Each	Net	2 15
369	Metal tube for 6 oz nursing bottles with rubber cushions	Each	Net	2 25
373	Trunnion cups for 250 cc bottles Nos 552, 558 with rubber cushions	Each	Net	5 00
392	Trunnion carriers for 150 cc Squibb Separatory funnels	Each	Net	3 00
393a	Trunnion carriers for Shaw Separatory funnels	Each	Net	2 25
395	Trunnion carriers for Goetz phosphorus tubes, No 556	Each	Net	3 50
502	15 cc plain glass tubes	Per dozen	Net	2 20
		Per six dozen	Net	8 75
505	15 cc graduated glass tubes, 1/10 cc div	Per half dozen	Net	3 25
506	25 cc plain glass tubes	Per dozen	Net	2 75
507	15 cc round bottom plain glass tubes	Per dozen	Net	1 40
		Per six dozen	Net	6.00
508	15 cc narrow neck glass tubes	Per dozen	Net	2.75
510	10 cc Hopkins vaccine tubes	Each	Net	1.20
		Per ½ dozen	Net	5.25
511	Babcock test tubes for human milk	Each	Net	.60
		Per ½ dozen	Net	2.75
515	50 cc plain lipped glass tubes	Per dozen	Net	2.75
		Per six dozen	Net	11.00
520	50 cc plain narrow neck glass tubes	Per dozen	Net	2.75
		Per six dozen	Net	11.00
525	50 cc graduated glass tubes ½ cc div to 10 cc, 1 cc div to 50 cc	Per ½ dozen	Net	5.50
535	Hart casein tubes	Per ½ dozen	Net	2.75
551	Shaw separatory glass funnels, for butter testing about 75 cc	Each	Net	3 3
552	250 cc glass prescription bottles	Per dozen	Net	2 50
554	Squibb glass separatory funnels, 150 cc	Each	Net	3 50
556	Goetz glass phosphorus tubes with stoppers	Each	Net	3 50
558	250 cc glass sterilizer bottles	Per dozen	Net	3 75
561	2 cc Board of Health glass tubes	Per 100	Net	6 50
566	Rubber stoppers for Board of Health tubes	Per 100	Net	2 25
568	Set 20 Board of Health tubes and 40 stoppers	Each	Net	2 75
570	15 cc rubber cushions, Cornell style	Per dozen	Net	1 00
571	50 cc rubber cushions, Cornell style	Per dozen	Net	2 15
579	Rubber pads for Babcock trunnion cups, No 362	Per dozen	Net	60
580	Rubber caps for tubes, Nos 502, 505, 507	Per dozen	Net	.75
581	Rubber cushions for 250 cc bottles No 552	Each	Net	.40
582	Rubber cushions for 250 cc bottles No 558	Each	Net	.80
583	Rubber caps for 250 cc bottles No 558	Per dozen	Net	1.75
584	Molded soft rubber caps for glass tubes No 520	Per dozen	Net	.85
585	Square sputum bottles with corks	Per dozen	Net	85
		Per gross	Net	9.25
594	Rubber cushions for 6 oz sterilizer nursing bottles	Each	Net	35
598	Rubber cushions for Goetz tube	Each	Net	1.95
750	Speed revolution counter	Each	Net	2.50

C-11629

C-11629 Centrifuge—Hand Model—Bausch & Lomb—Gives 1200 R P.M. with 50 turns of the handle; gears and pinion are protected from dust, handle construction makes it impossible to stop so suddenly that the contents of the tube are spilled Complete with two-arm sedimentation attachment, 15 cc. tubes, one graduated and the other ungraduated.

Each 12.50

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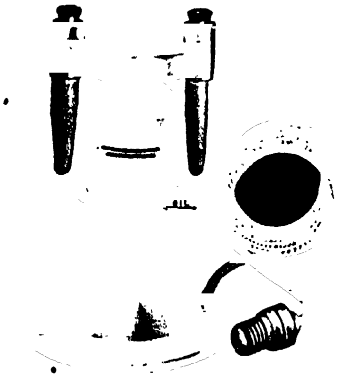


C 11635

C 11635 **Centrifuge — Electric** — An especially rigid and heavily built machine with rheostat incorporated in base, speed 1800 R P M with two 15 cc tubes Tube carrier acts as heavy balance wheel to insure ability and fan blades mounted below prevent overheating of windings of motor Ball bearings and complete with cord and plug Height 24 cm, rotating diameter 29 cm Maximum current consumption ¾ ampere

No A For 110 Volts A C or D C
Each ....Net 38 00
No B For 220 Volts A C. or D C
Each . . .. Net 43 00

(Please state voltage and current when ordering)

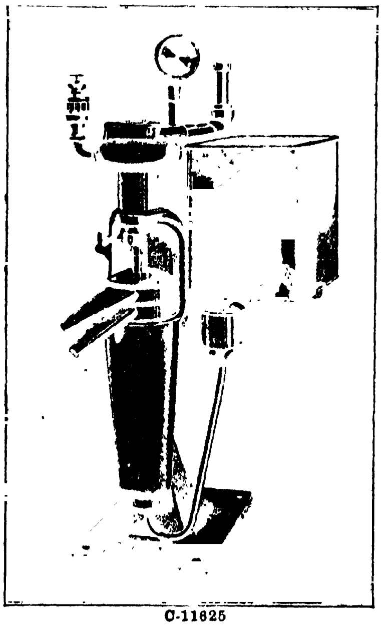
C-11639 **Centrifuge — Electric** — Same construction as No **C-11635** above, but with tube carrier for four 15 cc tubes

No A For 110 Volts A C or D C
Each .... Net 42.00
No B For 220 Volts A C or D C
Each . . Net 47 00

(Please state voltage and current when ordering.)

C-11642 **Dome Protector,** for above centrifuges, highly desirable as a safety factor, to prevent splashing and to increase the efficiency and speed of the machine approximately 50 per cent

Extra .... .Net 12.50



C-11625

C-11625 **Centrifuge—Sharpless Laboratory** — With turbine wheel attached to shaft for driving by steam at 20 pounds pressure R P M. of bowl 40000 developing a centrifugal force of about 41000 times that of gravity, consists of cast iron frame with steel tube or bowl 2 in in diameter and 8 in long suspended vertically from a flexible steel spindle, height 24 in, weight 55 lb

Each . Net 150 00

C-11625A **Centrifuge—Sharpless Laboratory** Same as No **C-11625** above, but driven by compressed air, 15 cubic feet per minute at 20 lb pressure being required

Each . Net 150 00

Hand driven and motor driven centrifuges of the above type can be supplied Prices and further information upon request

C-305 **Charcoal Blocks** Of fine hardwood charcoal, for blow piping and similar operations Size 4" x 1"

Per dozen . . . 1 15

C-306 **Charts — Atomic Weight** Compiled by Dr F W Clarke for the American Chemical Society and corrected up to 1918, size 42" x 62", mounted on linen back with rollers

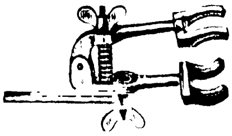
Each . Net 4.75

C-307 **Charts—Mendelejeff Periodic System**—Compiled by Dr F W Clarke, and corrected up to 1918, giving the periodic arrangement of the elements according to Mendelejeff on the basis of Oxygen 16 Size 42" x 62", mounted on linen back with rollers

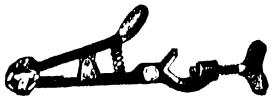
Each .. . . . . Net 4.75

C-308 **Charts—Metric**—Compiled by the U S Bureau of Standards showing, in full size and in perspective where necessary, the units of the International Metric System together with comparisons with units of the English system Tables showing the derivation of the names of the metric units and their abbreviations, together with tables of Metric and English equivalents are included, size 25" x 41", on heavy paper without rollers

Each . . . . Net .30



C 11670

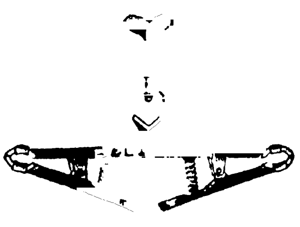


C-11680

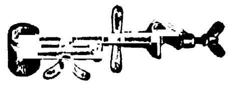
C-11670 **Clamps — Universal Apparatus** For condensers, etc, provided with swivel jaws, adapting themselves to irregular shapes

	No. A	B	C
Size . .	Small	Medium	Large
Each	65	.70	.85

C-11680 **Clamps—Burette** For one burette
Each .. .. .50



C-11687



C-11694

C-11687 **Clamps—Burette—**Double, for two burettes.
Each .... .75

C-11694 **Clamps—Burette—**Of stamped steel, adjustable by check-nut to any angle, an excellent clamp for general use.
Each .... .40

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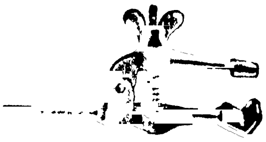
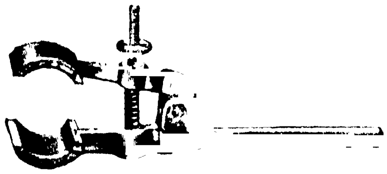

C 11706

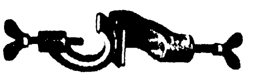
C-11706 Clamps—Burette

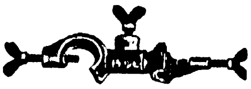
	No. A	B	C
Size	Small	Large	Extra Large
Each	.40	.55	.85


C-11714

C-11714 Clamps—Burette—For holding burettes or tubes at any angle

	No. A	B	C
Size	Small	Medium	Large
Each	.35	.55	.60

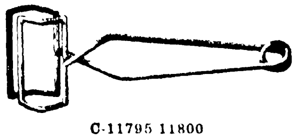

C 11718


C 11720

C-11718 Clamp Holders—For attaching clamps, extension rings, ring burners, etc., to apparatus support

	No. A	B
Size	Small	Large
Each	.30	.35

C-11720 Clamp Holders—Universal To set at any angle
Each .70

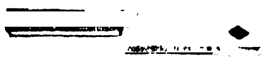

C-11795 11800

C-11795 Clamps—Test Tube, Stoddard's Of brass

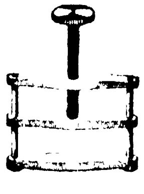
	No. A	B
Size	Small	Large
Each	.20	.25
Per dozen	2.25	2.65

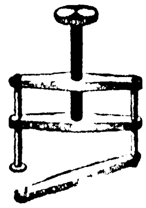
C-11800 Clamps—Test Tube, Stoddard's Of nickeled spring wire

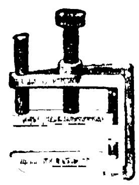
	No. A	B
Size	Small	Large
Each	.12	.15
Per dozen	1.20	1.50


C-11785

C-11785 Clamps—Test Tube Of wood with spring
Each .22


C-11825


C 11830


C-11835

C-11825 Clamps—Tubing, Hoffmann's—For rubber tubing nickel-plated

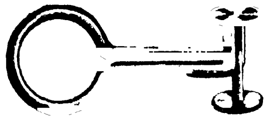
	No. A	B
Size	Small	Large
Each	.25	.30
Per dozen	2.80	3.20

C-11830 Clamps—Tubing, Hoffmann's Improved form; can be attached to tubing without disconnecting apparatus

	No. A	B
Size	Small	Large
Each	.27	.30
Per dozen	3.00	3.25

C-11835 Clamps—Tubing, Hoffmann's—Improved form; can be attached to tubing without disconnecting apparatus

	No. A	B
Size	Small	Large
Each	.30	.32
Per dozen	3.20	3.50


C-11840

C-11840 Clamps — Tubing, Mohr's Pinchcock — Of spring wire

	No. A	B	C	D
Size	Small	Medium	Large	Extra Large
Each	.13	.15	.18	.30
Per dozen	1.50	1.70	2.00	3.40

C-11845 Clamps — Watch Glass—Of brass, nickel-plated, without watch glasses

	No. A	B
Size	Small	Large
Each	.25	.30
Per dozen	2.60	2.90

C-11850 Clamps—Watch Glass, Bunsen's—Without watch glasses

	No. A	B
Diameter, mm	50	65
Each	.30	.35
Per dozen	2.90	3.25

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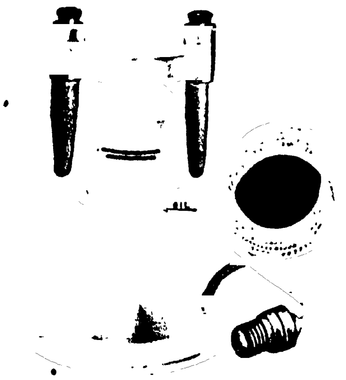
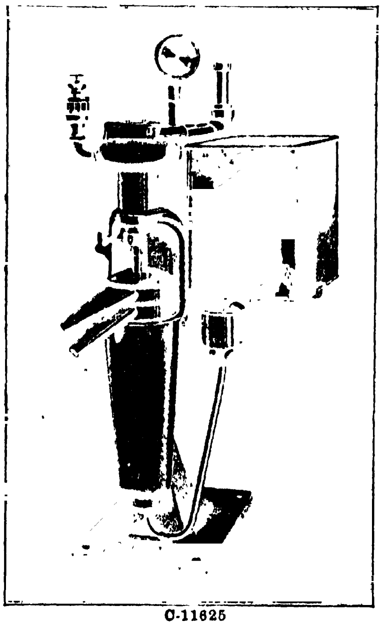


C 11635

C 11635 **Centrifuge — Electric** — An especially rigid and heavily built machine with rheostat incorporated in base, speed 1800 R P M with two 15 cc tubes Tube carrier acts as heavy balance wheel to insure ability and fan blades mounted below prevent overheating of windings of motor Ball bearings and complete with cord and plug Height 24 cm, rotating diameter 29 cm Maximum current consumption ¾ ampere
No A For 110 Volts AC or DC
Each ....Net 38 00
No B For 220 Volts AC or OC
Each . . . . Net 43 00
(Please state voltage and current when ordering)

C-11639 **Centrifuge — Electric** — Same construction as No **C-11635** above, but with tube carrier for four 15 cc tubes
No A For 110 Volts AC or DC
Each .... Net 42.00
No B For 220 Volts AC or DC
Each . . Net 47 00
(Please state voltage and current when ordering.)

C-11642 **Dome Protector,** for above centrifuges, highly desirable as a safety factor, to prevent splashing and to increase the efficiency and speed of the machine approximately 50 per cent
Extra .... .Net 12.50



C-11625

C-11625 Centrifuge—Sharpless Laboratory — With turbine wheel attached to shaft for driving by steam at 20 pounds pressure R P M. of bowl 40000 developing a centrifugal force of about 41000 times that of gravity, consists of cast iron frame with steel tube or bowl 2 in in diameter and 8 in long suspended vertically from a flexible steel spindle, height 24 in, weight 55 lb
Each . Net 150 00

C-11625A **Centrifuge—Sharpless Laboratory** Same as No **C-11625** above, but driven by compressed air, 15 cubic feet per minute at 20 lb pressure being required
Each . Net 150 00

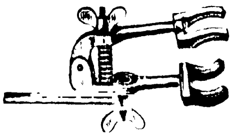
Hand driven and motor driven centrifuges of the above type can be supplied Prices and further information upon request

C-305 **Charcoal Blocks** Of fine hardwood charcoal, for blow piping and similar operations Size 4" x 1"
Per dozen . . . 1 15

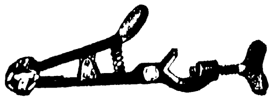
C-306 **Charts — Atomic Weight** Compiled by Dr F W Clarke for the American Chemical Society and corrected up to 1918, size 42" x 62", mounted on linen back with rollers
Each . Net 4.75

C-307 **Charts—Mendelejeff Periodic System**—Compiled by Dr F W Clarke, and corrected up to 1918, giving the periodic arrangement of the elements according to Mendelejeff on the basis of Oxygen 16 Size 42" x 62", mounted on linen back with rollers
Each .. . ... Net 4.75

C-308 **Charts—Metric**—Compiled by the U S Bureau of Standards showing, in full size and in perspective where necessary, the units of the International Metric System together with comparisons with units of the English system Tables showing the derivation of the names of the metric units and their abbreviations, together with tables of Metric and English equivalents are included, size 25" x 41", on heavy paper without rollers
Each . . . . Net .30



C 11670

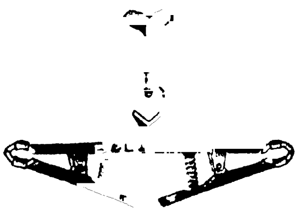


C-11680

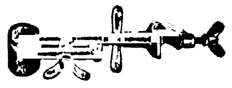
C-11670 **Clamps — Universal Apparatus** For condensers, etc, provided with swivel jaws, adapting themselves to irregular shapes

	No. A	B	C
Size . .	Small	Medium	Large
Each	65	.70	.85

C-11680 Clamps—Burette For one burette
Each .. .. .50



C-11687



C-11694

C-11687 Clamps—Burette—Double, for two burettes.
Each .... .75

C-11694 Clamps—Burette—Of stamped steel, adjustable by check-nut to any angle, an excellent clamp for general use.
Each .... .40

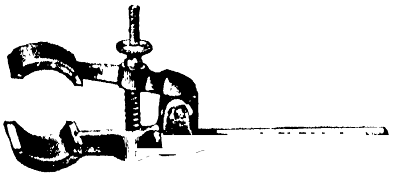
Prices subject to change without notice

Continued on Next Page

C 11706

C-11706 Clamps—Burette

No.	A	B	C
Size	Small	Large	Extra Large
Each	40	.55	.85



C-11714

C-11714 Clamps—Burette—For holding burettes or tubes at any angle

No.	A	B	C
Size	Small	Medium	Large
Each	.35	.55	.60

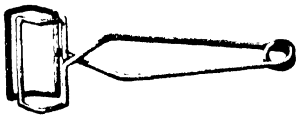
C-11718

C 11720

C-11718 Clamp Holders For attaching clamps, extension rings, ring burners, etc, to apparatus support

No.	A	B
Size	Small	Large
Each	.30	.35

C-11720 Clamp Holders—Universal To set at any angle
Each 70



C-11795-11800

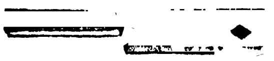
C-11795 Clamps—Test Tube, Stoddard's Of brass

No.	A	B
Size	Small	Large
Each	20	.25
Per dozen	2 25	2.65

C-11800 Clamps—Test Tube, Stoddard's Of nickeled spring wire

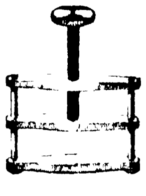
No.	A	B
Size	Small	Large
Each	.12	.15
Per dozen	1.20	1.50

Prices subject to change without notice

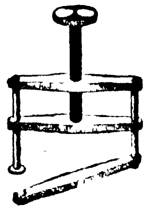


C-11785

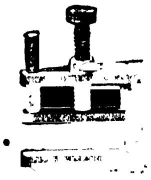
C-11785 Clamps—Test Tube Of wood with spring.
Each 22



C-11825



C 11830



C-11835

C-11825 Clamps—Tubing, Hoffmann's—For rubber tubing, nickel plated

No.	A	B
Size	Small	Large
Each	.25	.30
Per dozen	2.80	3.20

C-11830 Clamps—Tubing, Hoffmann's—Improved form; can be attached to tubing without disconnecting apparatus

No.	A	B
Size	Small	Large
Each	.27	.30
Per dozen	3.00	3.25

C-11835 Clamps—Tubing, Hoffmann's—Improved form; can be attached to tubing without disconnecting apparatus

No.	A	B
Size	Small	Large
Each	30	.32
Per dozen	3.20	3.50

C-11840

C-11840 Clamps — Tubing, Mohr's Pinchcock — Of spring wire

No.	A	B	C	D
Size	Small	Medium	Large	Extra Large
Each	.13	.15	.18	.30
Per dozen	1.50	1 70	2.00	3 40

C-11845 Clamps — Watch Glass — Of brass, nickel-plated, without watch glasses

No.	A	B
Size	Small	Large
Each	.25	.30
Per dozen	2.60	2.90

C-11850 Clamps—Watch Glass, Bunsen's—Without watch glasses

No.	A	B
Diameter, mm	50	65
Each	.30	.35
Per dozen	2.90	3.25

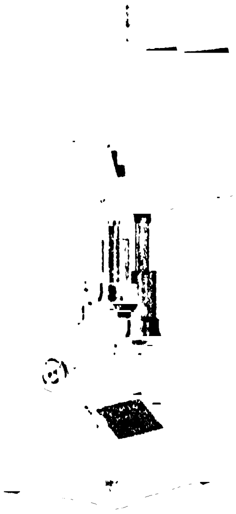
Continued on Next Page

COLORIMETERS

Colorimeter—Lavibond Tintometer.

This instrument furnishes a means by which the depth of color in liquids and solids can be accurately read in degrees, placed in their position in a permanent color scale, and registered for reproduction at any time

Descriptive matter covering the different sets for various types of work will be sent upon request



C-11880

C-11880 **Colorimeter—Dubosq, Bausch & Lomb**—An apparatus to measure color intensity of liquids by transmitted light, consists of heavy base and firm standard, assuring great stability and durability, base carries double reflector, one side silvered and the other opal, to give diffused illumination, standard carries on vertical surface two rack and pinion adjustments of regular microscope type for movement of cup or cylinder supports, pinion and operating heads are always in fixed location, so that readings are controlled only by observation and not by location of pinion heads, cups or cylinders have plano-parallel glass bottoms and are removable for easy cleaning, plungers, prisms and compound magnifier are attached to a bracket on upper part of standard, plungers are of selected optical glass, accurately ground and polished, prisms are of precise optical quality with fine central dividing line compound magnifier is of four lens construction, adjustable for focusing, cover on front of instrument excludes all light from the cylinders except that reflected by illuminating mirror; scales on rear surface of standard are graduated in millimeters and provided with vernier readings to 1/10 mm, rack-stops prevent cylinder and plunger from forcible contact, supplied with series of colored glasses for modifying light from either or both cylinders, furnished in wood case, tubes and scales 50 mm long

Each 125.00

C-11885 **Colorimeter—Dubosq, Bausch & Lomb**—Similar to No **C-11880** above, but with tubes and scales 100 mm long

Each 165.00

C-11881 **Nephelometer Attachment for above**—With 250 watt Mazda lamp for complete conversion of No. C-11880 Dubosq Colorimeter into Nephelometer.

Each 75.00

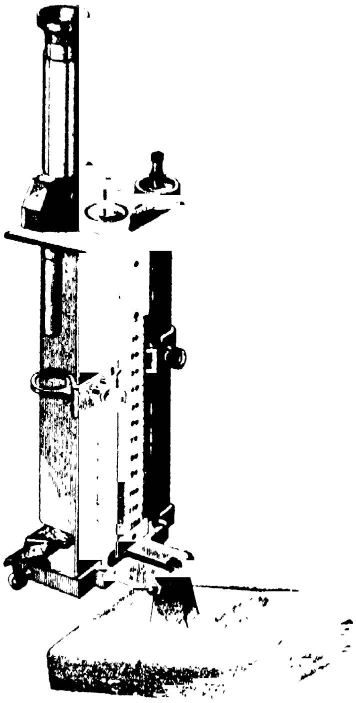
Prices subject to change without notice

C-11886 **Nephelometer Attachment for above**—Same as No. **C-11881**, but for a 100 mm size Dubosq

Each 90.00

C-11887 **Colorimeter Lamp** With 100 watt gas-filled Mazda bulb in well ventilated housing, spherical glass mirror reflector and daylight glass window, with 6 ft cord switch and plug for 110 volt circuit

Each 19.50



C 11907

C-11907 **Colorimeter—Kober's** A combination instrument for convenience of the analyst who may desire to use both colorimetry and nephelometry, cups containing the solutions are entirely separated from each other by dividing wall, thus eliminating the spattering of solutions from one cup into the other, extra heavy base keeps instrument in steady position, the movable verniers can be set at "zero" by simply loosening a thumb screw; the large brass scale is silvered to show the graduation more distinctly, prisms are attached to a separate plate for easy removal and cleaning, the mirror reflectors work independently of each other, and the reflected light can be so adjusted as to insure an absolutely even field, the dividing line in the "side-by-side" field is made as thin as possible to secure accurate readings, all plungers and cups have bottoms fused on to eliminate cement troubles permanently and will resist all acids, alkalis and heat, the stages travel on screw-threaded rods, which excels the old style rack and pinion method by eliminating lost motion and consequent inaccuracy; by attaching the instrument to a lighting source, it can be changed instantly into nephelometer, as the plungers are made of black glass tubing, all parts are made to be interchangeable; furnished with one pair of colorimetric cups and plungers

Each ....Net 85.00

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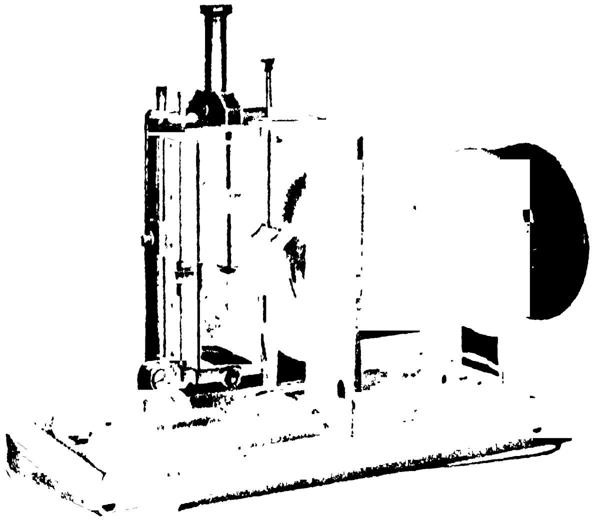


C 11912

C-11912 **Colorimeter—Nephelometer, Kober's**—Same as described under **C-11907**, but furnished with lamp house, as shown in illustration, one pair of short and one pair of long colorimetric cups, one pair of short and one pair of long nephelometric cups, stereopticon lamp, cord and plug, mounted on a black, polished board with switch

Each 120 00

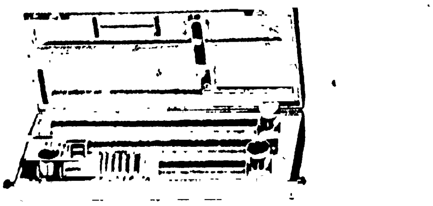
C 11889

C-11889 **Colorimeter—Biological Dubosq**—Constructed on the same principles as the Dubosq from an optical standpoint but reduced in size and simplified Cup for standard solution is moved up and down by hand and clamped in any desired position by means of thumb screw. Movement of unknown by rack and pinion

Scales in millimeters with verniers by which readings can be made to with 0 1 mm Maximum depth of liquid is 40 mm With light shield to exclude light and to protect instrument when not in use.

Each . . . . .Net 60.00

Case for above, extra 3.00



C-18700

C-18690 **Colorimeter—U. S. Geological Survey Standard**—For determining color in water analysis, by comparing color of water under examination with that of series of glass disks, rated in color values according to the •platinum-cobalt scale of parts of platinum per million, furnished complete, with four aluminum tubes—one with clips for holding disks, others 50, 100 and 200 mm long, respectively, for holding water to be tested—and six standard disks of amber-colored glass, mounted in aluminum, in compact morocco-covered case

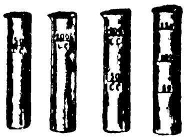
Each . . . . .Net 49.50

C-18695 **Turbidity Scale—U. S. Geological Survey Standard**—Of aluminum, 8 in long and graduated in parts per million, to one end is attached a tape, 4 ft long and similarly graduated, into other end is fastened a nickel-plated brass screw eye, containing a piece of rolled platinum wire to be viewed, depth of its disappearance to the eye indicates turbidity, complete in case

Each . . . . Net 9.00

C-18700 **Colorimeter and Turbidity Outfit**—Consists of Nos **C-18690** and **C-18695** above, combined in morocco-covered case

Each . . . . .Net 56.00



C-2180

C-2180 **Color Comparison Tubes—Nessler**—For the determination of ammonia in water; of clear, colorless glass, with polished bottom

No.	A	B	C	D
Graduated, cc	50	100	50-100	50 100-150
Each	.56	.67	.80	1.00

C-2185

C-2185 **Color Comparison Tubes—Nessler**—Tall form; with polished bottoms made from clear glass The 50 cc mark on the 50 cc tube is between 200 and 250 mm from the bottom, and the 100 cc mark on the 100 cc tube between 275 and 325 mm from the bottom. Tubes in sets of six or twelve have the 50 cc or 100 cc mark within 6 mm of same height See American Public Health Association, "Standard Methods of Water and Sewage Analysis," 1917.

No.	A	B
Capacity, cc	50	100
Each	.56	.75
Set of 6	3.60	5.25
Set of 12	7.50	11.25

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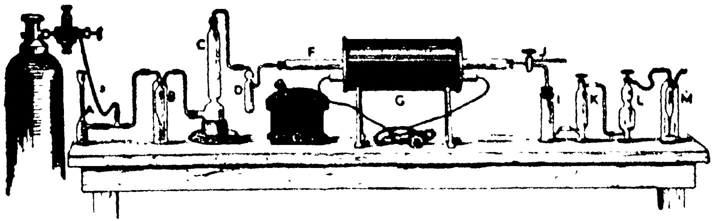


C 315

C 315 Combustion Apparatus—Fleming's Carbon determinations by this method are very rapid and accurate, five minutes only being required for the combustion proper and a complete determination can be finished in ten minutes. Oxygen may be passed at very rapid rate without possibility of a loss of CO_2 or moisture. One filling of absorption tube will last for over sixty combustions. Complete as illustrated without oxygen tank or regulator, with Hoskin's type FD 302 furnace and rheostat and silica tube, 24" x ¾" bore

Each .Net 62.75

(Please state voltage and current when ordering.)

Separate parts of above equipment.

No		Each
A	Mercury pressure gauge	Net 1.80
B	Washing bottle	Net 1.35
C	Calcium chloride jar	Net 2.00
D	Mercury valve	Net .70
E	Silica tube, 30" long by ⅞" i d	Net 5.75
F	Silica tube, 24" long by ¾" i d	Net 4.00
G	Furnace, Hoskin's FD 302 without rheostat	Net 30.00
H	Rheostat for above	Net 12.00
I	Zinc jar	Net .70
J	Stopcock	Net 1.80
K	Phosphoric anhydride jar	Net 2.50
L	Fleming absorption tube	Net 3.20
M	Washing bottle	Net 1.35

C-5550

C-5550 Combustion Boats—Coors porcelain, glazed throughout with exception of outside bottom surface. Can also be supplied unglazed.

No.	1	2	3	4
Length, mm	60	60	62	76
Width, mm	7	10	8	10
Height, mm	8	8	8	9
Each Net	.26	.26	.28	.29

No.	6	7	8
Length, mm	88	97	100
Width, mm	12	18	20
Height, mm	8	13	13
Each Net	.30	.32	.34

Prices subject to change without notice

C-320 Combustion Boats — C. M. Johnson— Of vitrified clay 120 x 15 mm for carbon in steel determination

Per dozen . Net 2.00

C-323 Combustion Boats, Alundum.

No	A	B	C
Length in	3½	3¾	5
Width in	½	⅝	¾
Each Net	.30	.35	.40

C-5565 Combustion Tubes Coors porcelain suitable for high temperature work specify glazing desired

No	0	1	2	3	4
Diam outside, mm	10	12.5	14	17	20
Diam inside, mm	6	10.5	10	12	15
Length, mm	1000	1000	1000	1000	1000
Each Net	6.72	6.72	6.72	7.56	8.40

No.	5	5a	6	7
Diam outside, mm	28	30	38	60
Diam inside, mm	20	25	28	43
Length, mm	1000	1000	1000	1000
Each Net	10.08	10.92	13.44	16.80

If longer or shorter lengths are required add or subtract .01 of price for each centimeter

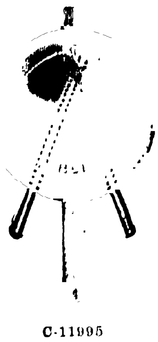
C-6065 Combustion Tubes—Vitreosil—Sand Surface—With one end reduced for length of 75 mm to bore of 3 mm and outside diameter of 6 mm; for direct connection with rubber tubing, are a great convenience in eliminating one stopper connecting and minimizing the difficulty of maintaining a gas-tight combustion train

No.	A	B	C	D	E	F
Length over all, mm	610	762	610	762	610	762
Bore, mm	19	19	22	22	25	25
Each Net	6.95	8.25	7.45	8.95	8.35	10.00

C-6070 Combustion Tubes—Vitreosil—Same as No. C-6065 above, but **glazed.**

No.	A	B	C	D	E	F
Length over all, mm	610	762	610	762	610	762
Bore, mm	19	19	22	22	25	25
Each Net	8.25	10.00	8.75	10.50	10.25	12.50

CONDENSERS



C-11995

C-11995 Condensers — Soxhlet's — Globe shape; of copper, nickel-plated, tinned inside

Each 4.25

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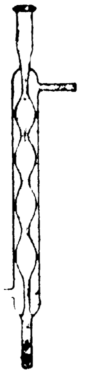
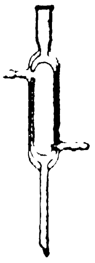
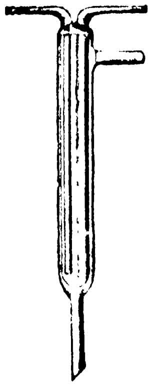
CONDENSERS


C 2210


C-2215


C 2225

C-2210 Condensers—Allihn's Of glass, with bulb condensing tube

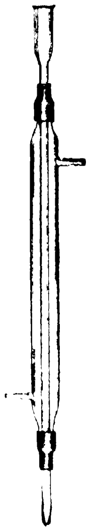
No	A	B	C	D	E
Length of Jacket, mm	200	250	300	400	450
Each	1.00	1 15	1 30	1 50	1 70

C-2215 Condensers — Davies' Improved A double surface condenser, the outflowing warm water does not heat the inflowing water

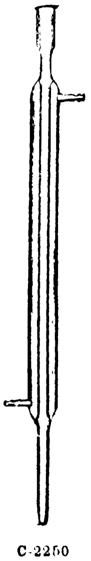
No.	A	B	C
Length of Jacket mm	150	200	300
Each	4.10	4 50	5.40

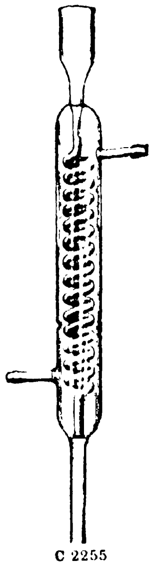
C-2225 Condensers—Hopkin's Reflux Excellent for extraction work Total length 350 mm

Each 3.15


C-2240

C-2245


C-2250


C 2255

C-2240 Condensers—Liebig's Of glass, with loose inner tube and rubber connections

No.	A	B	C	D	E	F
Length of Jacket, mm.	250	300	400	450	500	600
Each	.80	.90	.95	1.10	1.20	1.50

Prices subject to change without notice

C-2245 Condenser Tubes—Of glass; with adapter for condenser No C-2240.

No.	A	B	C	D
Length of Jacket, mm	200	250	300	400
Each	.20	.23	.25	.28

No.	E	F	G
Length of Jacket, mm	450	500	600
Each	30	.32	.45

C-2250 Condensers — Liebig's — Of glass, with inner tube sealed to body

No.	A	B	C	D	E	F
Length of Jacket, mm	250	300	400	450	500	600
Each	.90	1 00	1 15	1 35	1.50	1.80

C-2255 Condensers—Liebig's—(Graham's)—Of glass; with condensing tube in form of coil sealed in water jacket

No	A	B	C	D	E
Length of Jacket, mm	150	200	250	300	400
Each	1 00	1.15	1.30	1.60	2.10

CORKS

C-12013 Corks—Regular Length, XXX Quality.

Numbers	00	0	1	2	3	4
Diam., top, mm	8	9	10	11	12	14
Per gross	31	31	.31	.35	.42	.48
Numbers	5	6	7	8	9	10
Diam., top, mm	16	18	20	22	24	26
Per gross	.53	.58	.65	.90	1.10	1.25
Numbers	11	12	13	14	15	16
Diam., top, mm	28	29	30	31	32	34
Per gross	1 35	1.50	1.65	1.90	2.10	2.70
Numbers	17	18	20			
Diam., top, mm	36	38	40			
Per gross	2.90	3.15	3.75			

C-12015 Numbers 1-6, assorted.
Per gross .... .45

C-12016 Corks—Regular Length, XXXX Quality.

Numbers	00	0	1	2	3	4
Diam., top, mm	8	9	10	11	12	14
Per gross	.33	.33	.33	.40	.46	.56
Numbers	5	6	7	8	9	10
Diam., top, mm	16	18	20	22	24	26
Per gross	.65	.73	.87	1.10	1.35	1.55
Numbers	11	12	13	14	15	16
Diam., top, mm	28	29	30	31	32	34
Per gross	1.70	1.87	2.05	2.40	2.75	3.10
Numbers	17	18	20			
Diam., top, mm	36	38	40			
Per gross	3.65	3.95	4.55			

C-12017 Numbers 1-6, assorted.
Per gross .... .55

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C-12022 Corks—Short Form, XXX Quality.

Numbers	00	0	1	2	3	4
Diam., top, mm	8	9	10	11	12	14
Per gross	29	.29	29	.32	36	.40

Numbers	5	6	7	8	9	10
Diam., top, mm	16	18	20	22	24	26
Per gross	.46	.50	.58	.73	.87	1 08

Numbers	11	12	13	14	15	16
Diam., top, mm	28	29	30	31	32	34
Per gross	1 20	1 30	1.40	1.60	1 90	2 05

Numbers	17	18	20
Diam., top, mm	36	38	40
Per gross ..	2 20	2 40	2.85

C-12025 Corks—Short Form, XXXX Quality.

Numbers	00	0	1	2	3	4
Diam., top, mm	8	9	10	11	12	14
Per gross	.31	.31	.31	.35	.39	.44

Numbers . . .	5	6	7	8	9	10
Diam., top, mm	16	18	20	22	24	26
Per gross . . .	.54	.58	.72	.87	1 05	1.30

Numbers . . .	11	12	13	14	15	16
Diam., top, mm	28	29	30	31	32	34
Per gross	1.45	1.55	1.65	2 00	.230	2.50

Numbers . .	17	18	20
Diam., top, mm.	36	38	40
Per gross.....	2.65	2.90	3.40

C-12026 Numbers 1 to 6 assorted.

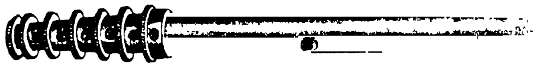
Per gross 45

C-12033 Corks—Flat, XXX Quality, $\frac{5}{8}$" long for wide mouth bottles, jars, etc

No	A	B	C	D	E	F
Diam., top, mm	50	53	56	59	62	65
Per dozen .	.63	.72	.83	.94	1.05	1 20

No.	G	H	I	J	K	L
Diam., top, mm	68	71	75	81	87	93
Per dozen .	1.40	1.50	1.70	2.15	2.60	3.10

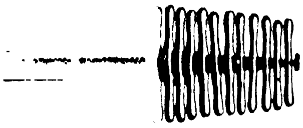
No.	M	N	O	P	Q
Diam., top, mm	100	112	125	138	150
Per dozen....	3.60	5.00	6.50	8.20	10.00



C-12040

C-12040 Cork Borers—Of hard brass.

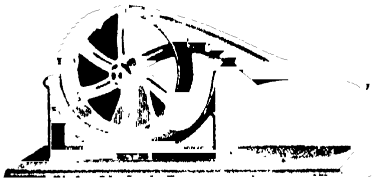
No.	A	B	C	D	E
Number in each set.	3	6	9	12	15
Per set	.60	1.15	1.90	2.85	4.10



C 12045

C-12045 Cork Borers—Of polished, hard brass, best make; with handle to each borer

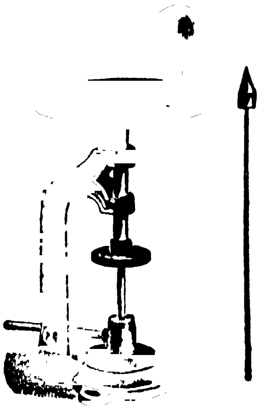
No	A	B	C	D	E
Number in each set	3	6	8	12	15
Sizes	1 3	1 6	1 8	1 12	1 15
Per set .	.80	1.50	2.60	3.40	4.70



C 12065

C-12065 Cork Press—Rotary Rolls the corks into desired tapering shape without splitting them, supplied in two sizes for corks up to 18 and 32 mm diameter, respectively

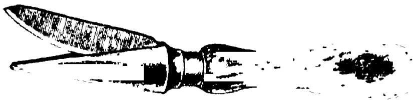
No.	A	B
Size .	Small	Large
Each	1.90	2.20



C-12060

C-12050 Cork Boring Machine—Improved model for boring holes of any size in corks and rubber stoppers; has special device, not shown in illustration, for holding borers, so that their misplacement or loss is avoided, furnished complete with set of eight borers

Each ....Net 22.50



C-12055

C-12055 Cork Borer Sharpener—Consists of a steel cone with knife.

Each 1.95

Prices subject to change without notice

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CRUCIBLES

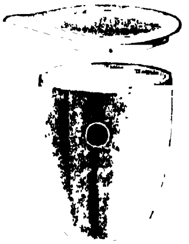
C-335 Crucibles—Alundum—For general work, not adapted for use where slags are formed. Without cover

No.	A	B	C
Capacity, cc	20	25	40
Diameter, mm	38	45	46
Height, mm	30	28	40
Each . . . Net	.35	40	40

C-340 Crucibles — Alundum — Porous For filtering, very rapid, supplied in 3 degrees of porosity, dense, medium, or porous

No.	A	B
Capacity, cc	25	35
Diameter, mm	35	40
Height mm	38	42
Each . . . . .Net	.35	.40

C-343


C-345

C-343 Crucibles—Iron—Of pure sheet iron, with lids

No.	A	B	C	D	E
Capacity, cc	20	50	100	200	400
Diameter, in	1½	2⅛	2¼	3⅛	3¾
Height, in	1¼	1½	2	2⅜	3
Each	.23	.30	.38	.52	.70

C-345 Crucibles—Nickel—High form with cover

No.	A	B	C	D	E	F
Capacity, cc	20	30	50	75	100	150
Diameter, in	1½	1⅝	1¾	2	2⅜	2¾
Height, in	1⅜	1¾	2	2¼	2½	2¾
Each . .	.95	1.10	1.25	1.85	2.40	3.00

C-5570-80

C-5590

C-5570 Crucibles—High form, Coors porcelain, glazed throughout with exception of outside bottom surface, without cover

No.	000	00	0	1	1a
Diameter rim, mm	26	30	35	41	45
Diam bottom, mm	12	14	17	20	21
Height, mm	19	25	27	35	40
Capacity, cc	5	10	15	30	40
Each . . . . . . .Net	.11	.14	.18	.29	.34

No.	2	3	4	5
Diameter rim, mm	52	62	72	87
Diam bottom, mm	25	30	34	40
Height, mm	43	50	59	72
Capacity, cc	57	95	155	280
Each . . . . .Net	.36	.42	.54	.66

C-5575 Covers for the above

No.	000	00	0	1	1a
Diameter mm	32	35	42	47	56
Each . . Net	06	.06	.06	.08	.11

No	2	3	4	5
Diameter, mm	59	73	81	95
Each . Net	11	14	.14	.18

C-5580 Crucibles—Ohio porcelain, high form without cover

No	000	00	0	1
Capacity about, cc	5	10	15	25
Diameter about mm	26	30	35	41
Height about, mm	19	25	27	35
Each . .	.09	13	.16	.22

No	2	3	4	5
Capacity about, cc	57	95	155	280
Diameter about, mm	52	62	72	87
Height about, mm	43	50	59	72
Each	.31	39	.44	.55

C-5585 Covers for the above

No.	000	00	0	1
Each	05	.05	.05	.05

No.	2	3	4	5
Each	.08	.13	.14	.17

C-5590 Crucibles—Low form, Coors porcelain, glazed throughout with exception of outside bottom surface, without cover

No.	0000	000	00	0	1
Diameter rim, mm	18	32	37	41	46
Diam bottom, mm	8	13	15	15	18
Height, mm	12	19	21	25	29
Capacity, cc	2 5	8	12	17	30
Each . . . . Net	.11	.14	.18	.22	.30

No.	2	3	4	5
Diameter rim, mm	56	67	81	96
Diam bottom, mm	18	23	29	35
Height, mm	36	44	52	65
Capacity, cc	50	90	145	265
Each . . .Net	.41	.52	.60	.74

C-5595 Covers for the above

No.	0000	000	00	0	1
Diameter, mm	22	39	44	47	52
Each . . . . .Net	.06	.06	06	.08	.08

No.	2	3	4	5
Diameter, mm	65	76	88	107
Each . . . . .Net	.12	.14	.18	.22

C-5600 Crucibles—Ohio porcelain, low form, glazed inside and outside, without cover

No.	000	00	0	1
Capacity about, cc	8	12	17	25
Diameter about, mm	32	37	41	46
Height about mm	19	21	25	29
Each	.10	.13	.16	.22

No.	2	3	4	5
Capacity about, cc . .	45	80	140	250
Diameter about, mm	56	67	81	96
Height about, mm	36	44	52	65
Each	.30	.38	.43	.51

C-5605 Covers for the above

No.	000	00	0	1
Each	.05	.05	.06	.08

No.	2	3	4	5
Each	.08	.17	.17	.17

Prices subject to change without notice

Continued on Next Page

C-5610-20 C-5635

C-5610 **Crucibles—Gooch**—Coors porcelain, with perforated bottom, glazed throughout with exception of outside bottom surface

No.	2	2a	3	4
Diameter rim, mm	27	33	35	40
Diameter bottom, mm .	18	20	22	25
Height, mm	30	33	40	43
Capacity, cc . . .	10	20	25	35
Each . ...Net	.36	.42	.48	.54

C-5615 **Covers** for the above.

No.	2	2a	3	4
Diameter, mm	35	39	42	47
Each .. . . Net	.06	.06	.06	.08

C-5620 **Crucibles—Gooch**—Ohio porcelain, glazed inside and outside, permanent perforated bottom, perforations ½ mm in diameter

No.	2	3	4
Capacity about, cc	10	25	35
Diameter about mm	27	35	40
Height about mm . .	30	40	43
Each	.25	.34	.43

C-5625 **Covers** for the above

No.	2	3	4
Each	.05	.05	.06

C-5630 **Crucibles—Gooch**—Coors porcelain, with two holes for suspending in extraction apparatus Size No 3, diameter rim, 35 mm, capacity, 25 cc
Each . . . . Net .48

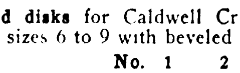
C-5635 **Crucibles**—Coors porcelain, of special shape with large filtering surface, for bitumen determination. Size A, diameter rim, 45 mm ; bottom, 35 mm.; height, 24 mm ; capacity, 40 cc.
Each ....Net .60

C-5675 **Crucibles — Caldwell** — Coors porcelain, without covers or perforated disk, glazed inside and outside, with open flange bottom to hold disk

No.	1	3
Diameter top, mm....................	33	39
Diameter bottom, mm................	20	26
Height, mm	33	40
Capacity, cc . . .	15	25
Each ....Net	.42	.48

C-5680 **Covers** for above Caldwell Crucibles

No.	1	3
Diameter rim, mm . . .	40	46
Each ....Net	.06	.08



C-5685

C-5685 **Perforated disks** for Caldwell Crucibles and funnels, sizes 6 to 9 with beveled edges.

No.	1	2	3	4	5
Diameter rim, mm..	18	20	22	25	30
Thickness, mm......	2	2	2	3½	4
Each ....Net	.23	.23	.24	.24	.28
No.	**6**	**7**	**8**	**9**	
Diameter rim, mm..	38	50	60	75	
Thickness, mm......	4	4	4	4	
Each ....Net	.36	.46	.54	.72	

Prices subject to change without notice

C 6075

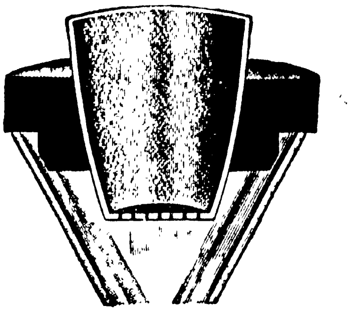
C-6075 **Crucibles—Vitreosil**—Glazed on exterior and interior, absolutely uniform in composition, and do not vary in either chemical or physical characteristics, are superior to platinum in that they resist action of reducing Bunsen flame and may be used constantly with boiling aqua regia without loss of weight, may also be used for ash determinations in many cases where platinum or silver crucibles are unsatisfactory, are superior to the best porcelain, may be cooled rapidly and do not condense moisture on the surface when cooling

No.	A	B	C	D
Approx capacity, cc . . .	4	10	15	25
Height outside, mm	19	19	25	28
Diam at top outside, mm	26	41	41	48
Each .. .. Net	.65	.85	.85	1.00
Covers to fit, each Net	.55	.55	.55	.65
No.	**E**	**F**	**G**	
Approx capacity, cc . .	40	65	145	
Height outside, mm . . .	37	44	51	
Diam at top outside, mm	57	67	81	
Each . . . . Net	1 15	1.65	2.00	
Covers to fit, each ....Net	.85	.85	.85	

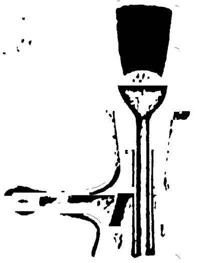
C-6080

C-6080 **Crucibles—Vitreosil**—Glazed platinum shape

No.	A	B	C
Approx capacity, cc..........	20	30	50
Height outside, mm	35	38	51
Diam at top outside, mm	35	43	51
Each .... Net	1.35	1.35	1.65
Covers to fit, each........Net	.55	.55	.65



C-12145



C-12155

C-12145 **Crucible Holders—Gooch, Bailey's**—Accommodate a 25 cc. porcelain Gooch crucible; fit ordinary 2-in glass funnel, the upper edge projecting over the edge of the funnel, making the seal, lower edge of holder rests on side of funnel and supports holder when suction is on the flask; without funnel or crucible

Each	.25
Per dozen	2.40

C-12155 **Crucible Holders—Gooch, Walter's**—A combined rubber stopper and Gooch crucible holder that will fit neck of a filter flask up to 45 mm, outside diameter, is easily removed from flask, and economical; glass part is protected from breakage; with funnel

Each	.45
Per dozen	4.50

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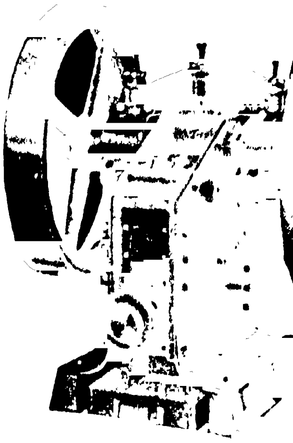
CRUSHING, GRINDING AND PULVERIZING EQUIPMENT



C 355

C-355 Crusher—Chipmunk, Type VC No 12 Small Type Readily adjusted for coarse or fine crushing, easily cleaned will reduce rock or coal from 2½ down to ¼ in and smaller at rate of 300 to 400 lb per hour when hand fed Opening of jaws ¾ in Power required 1 H P speed 400 R P M
Each Net 100 00

C-357 Crusher—Chipmunk, Type VC No 14 With tight and loose pulleys
Each . . Net 110 00

C-360

C-360 Crusher — Sturtevant — Laboratory Sample Grinder No. 0 With six inch grinding plates and tight and loose pulleys, reduces ¼" and finer to about 100 mesh at the rate of about 100 lb per hour, especially recommended for grinding coal, coke and dry materials; all parts easily accessible and circle of grinding surfaces may be changed by shifting the center of stationary disc so that cuts or scores on surfaces may grind themselves out Weight about 150 lb net, power required about 2 H P, speed 1200 R P M, pulley 6" x 2⅛"
Each .. .. Net 110 00

C-362 Extra set of semi steel discs.
Per set . . Net 4 75

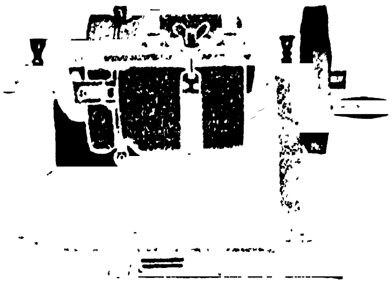
C-363 Crusher—Sturtevant Laboratory Sample Grinder, No. 2 Similar to the above but with ten inch grinding plates and of heavier construction, reduces ¼" and finer material to about 100 mesh at rate of 100 pounds per hour Pulley 7" x 3", approximate horse power required 3 H P, speed 750 R P M, net weight about 175 pounds
Each ....Net 137.50

Prices subject to change without notice

C-364 Extra set of Manganese Steel discs.
Per set . . Net 25.00

C-365 Extra set of Cast-iron discs
Per set . .Net 10.00

C-368 Crusher and Grinder—Ball Mill For reducing to very fine mesh any material either hard or soft, particularly those which must not come in contact with metal for grinding in a wet or dry stage, single specimen jar with one quart jar mounted, with pulley for power drive
Each . . . . Net 22 00



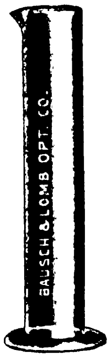
C 370

C-370 Crusher and Grinder—Ball Mill Single assay mill for hand or power operation, jar 8¾ x 9¾ inches and capacity wet about one gallon
Each . Net 50 00

Many other types of Crushing, Grinding and Pulverizing Equipment can be supplied. Let us know your requirements.

CYLINDERS

C-2295



C 2310

C-2295 Cylinders Of heavy glass With enlarged top, especially adapted for use with hydrometers

No.	A	B	C
Height, mm	350	300	400
Diameter at top, mm	50	75	75
Diameter at bottom, mm	40	50	65
Each	.70	1.00	1.25

C-2310 Cylinders Of heavy glass With lip Ungraduated

No.	C	D	E	G
Height, mm	125	150	150	200
Diameter, mm	40	25	40	25
Each	.32	.32	.34	.36
No.	I	J	M	O
Height, mm	210	250	300	350
Diameter, mm	40	40	50	50
Each	.38	.48	.54	.62

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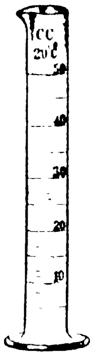
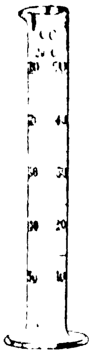
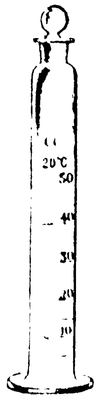


C-2315

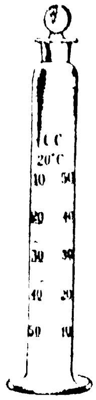
C 2320



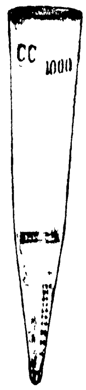
C 2330



C 2355



C 2370



C-2380

C-2315 **Cylinders—Graduated**—With single graduations and lip, on foot

No.	D	E	G	I	J
Capacity, cc	25	50	100	150	200
Graduated, cc	½	½	1	2	2
Each	40	45	.50	67	68

No.	K	M	N	O	P
Capacity, cc	250	500	1000	1500	2000
Graduated, cc	2	5	10	20	20
Each	70	1 00	1 45	3 15	3 60

C-2320 **Cylinders—Graduated**—Graduated at 20°C to meet the requirements of the U S Bureau of Standards

No.	B	C	D	E
Capacity, cc	10	25	50	100
Graduated, cc	1/10	1/5	1/5	1
Each	2.90	4 00	4 70	5.00

No.	F	G	H
Capacity, cc	250	500	1000
Graduated, cc	5	5	10
Each	6 20	8.25	9.75

C-2330 **Cylinders—Graduated** Double graduations, reading up and down, with lip, on foot

No.	D	E	G	J
Capacity, cc	25	50	100	200
Graduated, cc	½	1	1	2
Each	.45	.55	.65	.90

No.	K	L	M	N
Capacity, cc	250	300	500	1000
Graduated, cc	2	2	5	10
Each	1.00	1.20	1.35	1.80

C-2355 **Cylinders—Mixing**—With ground glass stopper, on foot, graduations reading up only.

No.	C	D	E	H	K	L
Capacity, cc	25	50	100	250	500	1000
Each	.85	1 00	1.15	1.75	2.35	3.25

C-2360 **Cylinders—Mixing**—With glass stopper, graduated at 20°C to meet the requirements of the U S. Bureau of Standards

No.	B	C	D	E	F	G
Capacity, cc	25	50	100	250	500	1000
Graduated, cc	1/5	1/5	1	5	5	10
Each	4.10	5.80	6.50	5.50	9.75	11.25

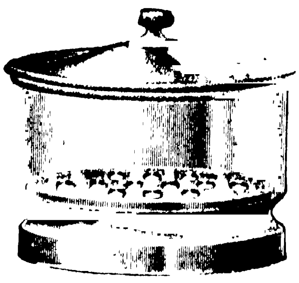
C-2370 **Cylinders—Mixing**—With ground glass stopper, on foot, graduated to read up and down.

No.	C	D	E	F
Capacity, cc	25	50	100	150
Each	.90	1.10	1.25	1.55

No.	H	K	L
Capacity, cc	250	500	1000
Each	1.80	2.70	3.60

C-2380 **Cylinders—For Testing Sewage**—Of conical shape throughout graduated from tip up, at points from 0 to 100 cc total capacity, 1000 cc

Each 2.60



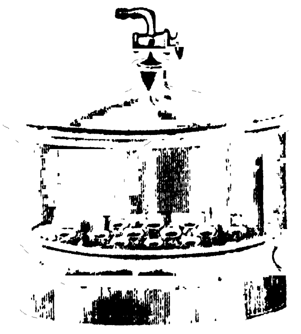
C-2410

C-2410 **Desiccators—Fruehling and Schultz's**—With glazed, perforated porcelain plate

No.	A	B
Diameter, mm	200	250
Each	10 50	17.20

C-2412 **Desiccators—Fruehling and Schultz's—Pyrex glass**—With glazed porcelain plate 8″ inside diameter

Each ....Net 13.00



C-2415

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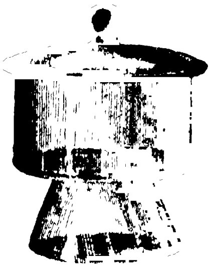
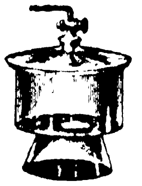
C-2415 Desiccators—Fruehling and Schultz's Same as No C-2410 above, but with ground in stopcock in lid Not guaranteed for high vacuum

No	A	B
Diameter, mm	200	250
Each	14 50	21 00

C-2417 Desiccators—Fruehling and Schultz's—Same as No C-2415 above, but of Pyrex glass 8″ inside diameter, with plate

Each . . . . Net 19.50


C-2430


C-2435

C-2455

C-2430 Desiccators—Scheibler's—With wide, finely ground flange, to which covers are accurately fitted

No.	A	B	C	D	E
Diameter, mm	100	125	150	200	250
Each	1.15	1.70	2 15	5 70	15 00

C-2435 Desiccators — Scheibler's—Vacuum, same as No C-2430 above, but with ground-in, glass stopcock and hook in lid Not guaranteed for high vacuum

No.	A	B	C
Diameter, mm	150	200	250
Each	4 50	10 50	16 50

C-2455 Desiccators—Triangular—Of heavy glass, designed for use in balance case; width of side, 2 in, height, 1½ in

Each 60

C-5705 Desiccator Plates—Coors porcelain, glazed on one side, on three small feet

No.	0	1	2	2a
Diameter, mm	85	95	115	120
Number of holes	3	3	4	5
Diameter of holes, mm	23	30	30	23
Each . . . . Net	.78	.90	1.02	1.14
No.	**2b**	**3**	**4**	**5**
Diameter, mm	125	140	190	230
Number of holes	8	5	7	8
Diameter of holes, mm	23	30	30	50
Each . . . . Net	1.32	1.50	2.40	3.00

C-5710 Desiccator Plates—Ohio porcelain, with holes, glazed on top, mounted on three small feet

No.	A	B	C	D	E
Diameter, mm	90	110	140	190	230
Number of holes	3	4	5	6	8
Diam of holes, mm	26	26	26	26	26
Thickness, mm	5	5	5	6	7
Each	.65	.77	.95	1.55	1.80

C-5715 Desiccator Plates—Coors porcelain, glazed on one side, without feet.

No.	4	5
Diameter, mm	190	230
Number of holes	7	8
Diameter of holes, mm	30	30
Each . . . . Net	2.10	2.52

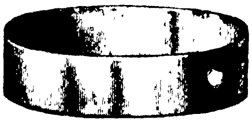
C-5722 Desiccator Plates—Coors porcelain, glazed on one side without feet, with numerous small holes, thumb hole in center

No.	3	4	5
Diameter, mm	140	190	230
Thickness, mm	4	5	5
Diameter of holes, mm	5	5	5
Each . . . . Net	1.68	2 28	2.70

C-5725 Desiccator Plates—Ohio porcelain, with no feet, top glazed, profusely perforated

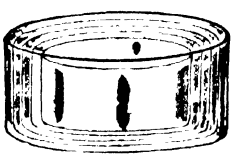
No.	A	B	C
Diameter, mm	140	190	230
Diameter of holes, mm	5½	5½	5½
Thickness, mm	5	6	7
Each	1 05	1.70	2.10

DISHES


C-14875

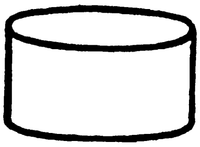
C-14875 Dishes—Aluminum—For milk analysis, with flat bottom

No.	A	B	C	D	E
Diameter, in	2	2½	3	3½	4
Height, in	½	⅝	¾	⅞	1
Each	.23	.26	.35	.45	.53


C-2470

C-2470 Dishes — Crystallizing — Low Form — Of resistance glass, with flat bottom and polished edges

No.	A	B	C	D	E	F
Diameter, mm	40	50	60	70	80	90
Height, mm	30	35	35	35	40	50
Each	.12	.12	.13	.14	.15	.16
No.	**G**	**I**	**J**	**K**	**L**	**M**
Diameter, mm	100	125	150	170	190	215
Height, mm	50	65	75	85	95	110
Each	.20	.36	.48	.64	.80	.90


C 2472

C-2472 Dishes—Crystallizing—Pyrex.

No.	A	B	C	D
Diameter, mm	70	80	90	100
Height, mm	50	40	50	50
Each	.45	.40	.45	.55
No.	**E**	**F**	**G**	**H**
Diameter, mm	125	150	170	190
Height, mm	65	75	90	100
Each	.85	1.15	1.25	1.50

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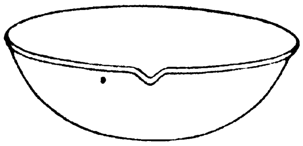
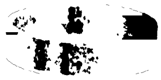


C-5730-40



C 5765

C-5730 **Dishes—Evaporating**—Coors porcelain, with lip, sizes up to 5 are glazed inside and outside with exception of rim, larger sizes are partly glazed outside

No.	000	00	0	1	2	3
Diameter, mm	60	70	80	85	90	100
Height, mm.	24	27	30	33	37	42
Capacity, cc	35	60	80	100	140	175
Each Net	14	22	24	36	42	48

No.	4	5	6	6a	7	8
Diameter, mm	110	120	145	162	185	215
Height, mm	43	50	48	51	54	63
Capacity, cc.	210	300	385	535	765	1285
Each Net	54	.66	84	96	1 08	1 44

No.	8a	9	10	11	12	13
Diameter, mm	230	265	305	360	400	460
Height, mm	70	80	95	116	140	175
Capacity, cc	1430	2200	3250	5700	10000	16500
Each Net	1 80	2 16	3.60	4 80	10 80	21.60

C-5735 **Dishes—Evaporating** Ohio porcelain, with lip, numbers 000 to 4 are entirely glazed, larger sizes are glazed inside, but only partly outside

No.	000	00	0	1	2	3
Diam os, mm	60	70	80	85	90	100
Capacity, cc	35	50	80	100	140	175
Each	13	.16	.18	21	.30	.34

No.	4	5	5a	6	6a	6b
Diam os, mm	110	120	125	145	135	170
Capacity, cc	210	300	330	385	535	690
Each	39	47	51	60	.73	.67

No	7	8	8a	9
Diam os, mm	185	215	230	265
Capacity, cc	765	1285	1430	2200
Each	.82	1.02	1 50	1.62

No.	10	11	12	13
Diam os, mm	305	360	400	460
Capacity, cc	3250	5700	10000	16500
Each	2.55	3.40	7.65	13.50

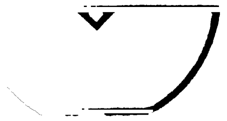
C-5740 **Dishes—Evaporating**—Coors porcelain, shallow form with lip, glazed inside but only partly outside.

No.	000	1	2	3	4
Diameter, mm	45	71	80	95	105
Height, mm	15	17	20	23	30
Capacity, cc	10	45	50	90	145
Each Net	.18	.24	.30	.48	.60

No.	5	5a	6	7
Diameter, mm	120	128	140	160
Height, mm	34	34	40	48
Capacity, cc	195	225	325	530
Each Net	.72	.78	.90	1.08

C-5765 **Dishes—Evaporating**—Ohio porcelain, flat bottom, for milk evaporation.

No.	A	B	C
Diameter, mm	40	43	72
Height, mm.	7	11	16
Each	.09	.17	.39



C 2487

C-2487 **Dishes—Evaporating** Pyrex glass with flat bottom and lip

No	A	B	C	D	E	F
Diameter, mm	80	90	105	125	150	200
Height mm	45	50	55	65	80	100
Each .. Net	.35	.40	.45	.75	1.00	1.30

C 380

C-380 **Dishes—Evaporating**—Nickel Of pure sheet nickel with lip and flat bottom, highly polished

No.	A	B	C	D
Capacity, cc	40	100	200	300
Diameter, in	2	2¾	3½	4
Each	1 30	1 70	2.55	3.40

Dishes—Evaporating Platinum—See No **C-16385.**

C 6105

C-6105 **Dishes — Evaporating** Vitreosil — Glazed — Flat, shallow form, with lip

No.	B	C	D
Approximate capacity, cc	30	75	150
Diameter inside, mm	73	95	124
Depth inside, mm	13	18	21
Each Net	1.65	1.85	2.50

C-6100

C-6100 **Dishes—Evaporating**—Vitreosil—Glazed—With lip; extremely durable and superior to the best porcelain; may be safely heated over naked flame

No.	A	B	C	D	E	F
Approx capacity, cc	25	45	80	90	100	200
Diameter inside, mm	51	70	82	89	98	109
Depth inside, mm	21	25	30	22	30	44
Each .....Net	1.35	1.50	1.65	1.85	2.15	2.50

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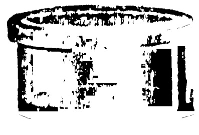
C-12180 Dishes—Lead—For use in etching with hydrofluoric acid, etc

No	A	B	C	D	E
Diameter, mm	50	65	75	100	125
Each	12	16	.20	32	53

C 2490



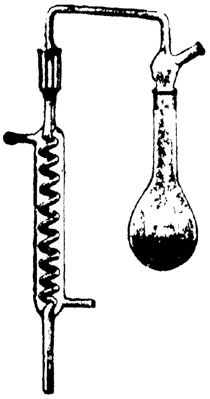
C 2495

C-2490 Dishes—Petri Of resistance glass, with overlapping, loosely fitting glass covers

No.	E	J	K
Diameter, mm	80	100	100
Depth, mm	10	10	15
Each	25	30	.30

C-2495 Dishes—Preparation—Stender's With grooved, accurately ground cover to fit

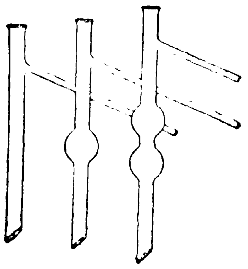
No.	A	B	C	D
Height, mm	24	30	35	90
Diameter, mm	36	50	60	60
Each	17	23	.32	.32



C-2510

C-2510 Distilling Apparatus For the determination of ammonia in water, the connecting tube is provided with an inlet to allow of permanganate solution, being easily poured into the flask after free ammonia has been distilled off. A mercury seal connection with condenser insures a perfect joint and easy disconnection

Each 8 00



C-2515 20 25

C-2515 Distilling Tubes—For fractional distillation, plain form

Each 28

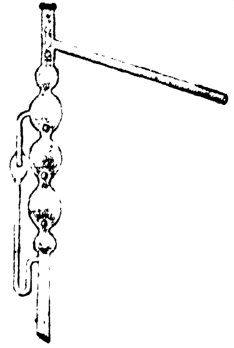
C-2520 Distilling Tubes—With one bulb

Each 30

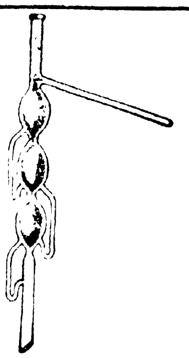
C-2525 Distilling Tubes—With two bulbs

Each 38

Prices subject to change without notice



C-2530



C-2535

C 2540

C-2530 Distilling Tubes—Glinsky's—With glass valves

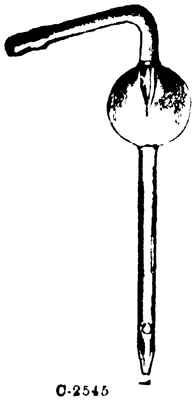
Each 2.35

C-2535 Distilling Tubes—LeBel-Henninger's.

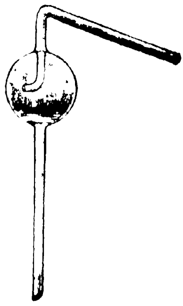
No.	A	B	C
Number of bulbs	2	3	4
Each	1.80	2 00	2.40

C-2540 Distilling Tubes—Hempel's—Filled with glass beads, length, 400 mm

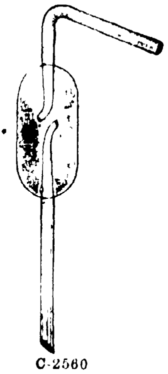
Each 1 30



C-2545



C 2550



C-2560

C-2545 Distilling Tubes—Hopkins'—Safety form for rapid work in nitrogen determinations, with single, straight tubulation inside bulb

Each 1.15

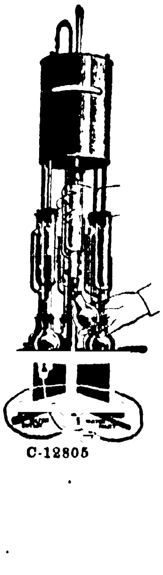
C-2550 Distilling Tubes—Kjeldahl's—Spherical form, with one bent connecting tube in bulb

Each 65

C-2560 Distilling Tubes—Kjeldahl's—Cylindrical form, with two curved connecting tubes in bulb

Each 1.10

EXTRACTION APPARATUS



C-12805

C-12805 Extraction Apparatus—Revolving type to accommodate any style or type of glassware; sliding condensing tube obviates the necessity of removing corks when once placed, no valves or washers, adjustable in height, only requires about one square foot of space; no rubber tubing or clamps with condenser; only one connection at water inlet and outlet necessary; furnished for either 110 or 220 volt current direct or alternating, without glassware

Each . . . . .Net 60.00

(Please specify voltage and current when ordering.)

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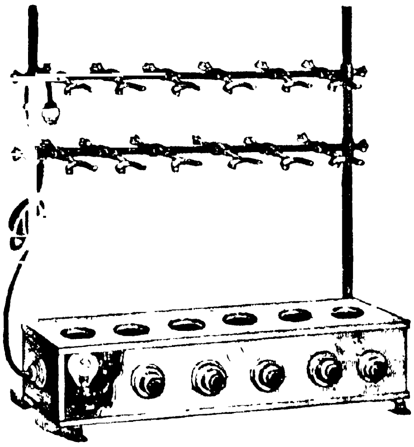
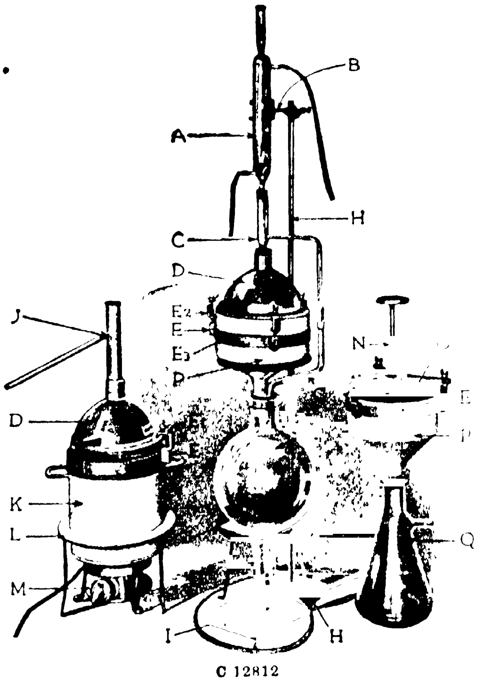


C 12810

C-12810 Extraction Apparatus Heater Has set of six electric lamps, each with switch, encased in supporting chamber made of asbestos wood, 30 in long x 5½ in wide x 7 in high, iron upright supports have an extreme height of 31 in, horizontal rods are adjustable in height, provided with six sets of adjustable clamps for extractors and condensers

Each ....Net 75 00

(Please state voltage and current when ordering.)



C 12812

Extractor—Will—Combination Equipment—This is in reality a combination of standard equipment which, by the use of a few specially made parts, may be applied to the operations of extraction, distillation, sublimation, ordinary and pressure filtration on a comparatively large laboratory scale It consists of a 200 mm Buchner funnel with an upper ground edge and a Pyrex glass dome taken from a standard Pyrex vacuum pan These are fitted together by means of a special adapter clamp frame either with or without rubber or cork gaskets between the dome and extractor body or Buchner A metal Soxhlet condenser and side vapor tube may be used or a glass condenser with glass vapor tube having a rubber slip connection as shown in the illustration This latter is to be preferred for corrosive liquids The boiling flask may be of either 3 or 5 liter capacity, the same number 10 rubber stopper, fitting either flask The progress of the extraction may be readily observed and the boiling of the liquid regulated to obtain a maximum degree of percolation through the material as a constant liquid level can be maintained in the extractor proper At the completion of the extraction it is possible to draw down all liquid held by the material by the use of an ordinary Pyrex filtering flask without transfer In the case of sticky or gummy material the use of the special filter press head is to be recommended

The Pyrex vacuum pan is excellent for concentrating to a semi solid condition as the low pressure employed and the removable dome allow of easy transfer of the finished material

The illustrations show three actual uses of this combination equipment, all parts of which may be utilized in other operations in the laboratory

C-12812-A Apparatus for Distillation, Sublimation and Concentration Consists of Pyrex still head (J), Pyrex dome (D) Special "Will" adapter frame (E), Suberite ring (E 1), Water bath (K), Tripod for water bath (L), Electric hot plate, 3-heat (M), Pyrex vacuum pan (D-1)

Complete as illustrated, with accessories

Each ... . Net 32 50

C-12812-A 1 Apparatus for Distillation, Sublimation and Concentration Same as No **C-12812-A,** but without electric hot plate (M)

Complete, with accessories

Each . . Net 22.50

C-12812-B Apparatus for Extraction—Capacity 2 liters Consists of Allihn's condenser (A), Universal clamp (B), External glass vapor tube (C), Pyrex dome (D), Special "Will" adapter frame (E), Buchner funnel (P), Pyrex round bottom flask, 3 liter capacity (F), Tripod support for flask (G), Extra large stand with ring set (H); Triple Bunsen burner (I)

Complete as illustrated, with accessories

Each . . Net 36.00

C-12812-B-1 Apparatus for Extraction- Same as No **C-12812-B,** but with Soxhlet globe tinned copper condenser instead of Allihn condenser, with accessories

Each . . .. Net 38.25

C-12812-B-2 Apparatus for Extraction Same as No **C-12812-B,** but with Soxhlet globe tinned copper condenser with copper vapor tube attached instead of Allihn's condenser and external glass vapor tube, with accessories

Each . ... Net 38.25

C-12812-C Apparatus for Ordinary and for Pressure Filtration Consists of special "Snell" filter press head (N), Filter press head block (O), Special "Will" adapter frame (E), Buchner funnel (P), Pyrex filtering flask, two liter capacity (Q)

Complete as illustrated, with accessories

Each .... Net 19.50

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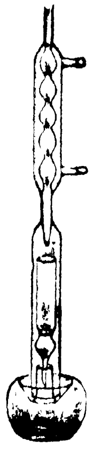
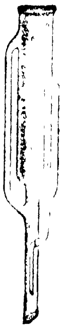
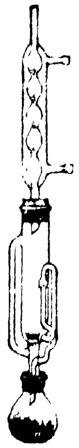
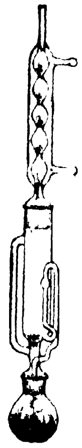
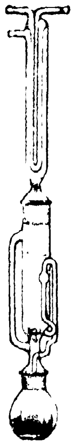

C 2635


C 2640


C-2645


C-2650


C-2655

C-2635 **Extraction Apparatus—Knorr's** Complete with condenser, extraction tube and Knorr flask, 100 cc capacity, glass parts only, see U S Bureau of Chemistry circular No 69
Each 6.00

C-2640 **Extraction Apparatus—Soxhlet's** Of clear, white glass, extraction tube only

No.	A	B	D
Approx diameter of tube, mm	30	38	50
Approx capacity to top of syphon, cc	70	100	200
Each	1.10	1.40	2.10

C-2645 **Extraction Apparatus—Soxhlet's** Complete with flask and condenser, fitted with best quality corks

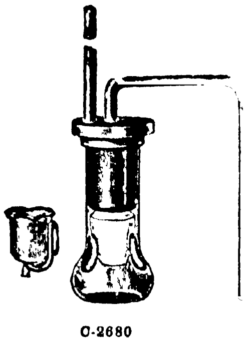
No.	A	B	D
Approx diameter of tube, mm	30	38	50
Approx capacity, cc	70	100	200
Each	2.90	3.10	4 00

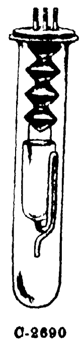
C-2650 **Extraction Apparatus—Soxhlet's** - With all joints ground air-tight, complete with three flasks and condenser

No.	A	B	C
Approx diameter of tube, mm	30	38	50
Approx capacity to top of syphon, cc	100	150	200
Each	4.00	4 50	5.40

C-2655 **Extraction Apparatus—Soxhlet's**—Same as No C-2650 above, but fitted with Hopkins' condenser instead of Allihn's bulb condenser

No.	A	B	C
Diameter of Soxhlet's tube, mm	30	38	50
Capacity, cc	60	100	200
Each	4.50	4.80	5.75


C-2680


C-2690

C-2680 **Extraction Apparatus—Bailey-Walker's**—Consisting of a metal condenser, small glass flask of special shape, and a small glass syphon cup This is one of the most compact forms of extraction apparatus and can be used for any kind of work The flask is light and can be accurately weighed and easily cleaned Made according to the design of Bailey and Walker, of the U S Bureau of Chemistry (See Journal of Industrial & Engineering Chemistry, 1914, vol VI, p 497)
Each 6.20

Extra Metal Condenser.
Each 5.00

Extra Syphon Cup.
Each .... .70

Extra Gooch Crucible, Coors porcelain.
Each ....Net .48

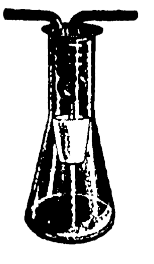
Extra Flask.
Each ....Net .50

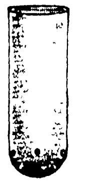
C-2690 **Extraction Apparatus—Wiley-Richardson**—A simple form, recommended where a great deal of work is to be done on fats, oils, gums and resins, combines the simplicity and efficiency of the original Wiley apparatus with the maceration and percolation method of washing, as in the regular Soxhlet apparatus, complete with glass syphon cup, but without extraction thimbles
Each 7.50

Extra Condenser.
Each 5.50

Extra Syphon Cup.
Each .... .75

Extra Tube.
Each 1.25


C-2695


C-2710

C-2695 **Extraction Apparatus—Cottle's**—Underwriter's Laboratories form; consists of metallic spiral reflux condenser, supporting a porcelain Gooch crucible by means of platinum or aluminum wire, all contained in specially designed, long neck Erlenmeyer flask, the entire apparatus being only 6 in high and 3 in wide; especially recommended for use in testing rubber compounds as used on wires and cords.
Each 3.35

Extra Condenser.
Each 2.55

Extra Gooch Crucible, Coors porcelain.
Each ....Net .48

Extra Flask, Pyrex glass.
Each ....Net .32

C-2710 **Extraction Thimbles**—Of glass; round bottom, with perforations.

No.	A	B	C
Height, mm	80	80	123
Diameter, mm	25	33	43
Each	.30	.45	.65

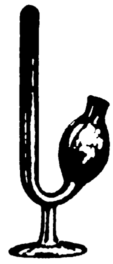
Continued on Next Page

C-12830 **Extraction Shells—Alundum**—Constant in weight and may be used repeatedly May be cleaned by immersion in strong acid and ignition Can be supplied in three degrees of porosity

No.	A	B	C	D	E
Height, mm	90	70	80	100	55
Diameter, mm	19	25	30	34	35
Shape of bottom	Flat	Flat	Flat	Round	Flat
Each ... Net	.60	.70	.75	.90	.80

C-12835 **Extraction Thimbles—Whatman's**—Made from the same high grade material as Whatman's Filter Paper and rendered fat free by a special process Absolutely seamless and can be used repeatedly Single and double thickness in sealed boxes of 25 thimbles

No.	A	B	C	D	E	F	G	H
Size, mm	19 x 50	19 x 90	22 x 80	26 x 60	25 x 80	30 x 77	33 x 80	33 x 94
Per box of 25, single thick	3.15	3.15	3 15	3.15	3.55	3.55	3 55	4.40
Per box of 25, double thick	5.28	5.28	5 28	5 28	5.92	5.92	5.92	7.36



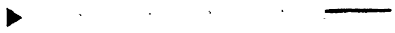
C 2710

C-12850 **Fermentation Tubes** On foot, ungraduated

No.	A	B	C
Length, mm	145	170	195
Diameter, mm	13	15	17
Each	.27	.32	36

Fermentation tubes of American Public Health Association Specifications as well as those without foot and with special graduation, can also be supplied Prices on request

C-12875



C 12880

C-12875 **Files—Round**—Rat-tail Best quality

No.	A	B	C	D
Length, mm	75	100	125	150
Each	.14	.16	.18	.20

C-12880 **Files—Triangular**—For cutting glass tubing, best quality

No.	A	B	C	D
Length, mm	75	100	125	150
Each	.12	.14	.15	.18

C-12885 **File Handles**—For use with the above

Each	.07
Per dozen	.75

FILTER PAPER

C-12940 **Filter Paper—Will, White**—Circular filters; put up in packages of 100 filters and found by test to be equal to higher priced papers.

No.	A	B	C	D	E	F	G	H	I	J	K
Diameter, mm	55	70	90	110	125	150	185	240	270	320	385
Per hundred	.12	.15	.16	.21	.25	.32	.40	.75	1.00	1.20	1.55

C-12945 **Filter Paper—Will, White**—In sheets, 480 x 480 mm.

Per hundred	2.80

C-12950 **Filter Paper—Will, Gray** Circular filters, tough and durable

No.	A	B	C	D	E	F	G
Diameter, mm	150	190	250	330	400	450	500
Per hundred	40	.50	.85	1.10	1 50	2.20	2.70

C-12955 **Filter Paper—Will, Gray** In sheets, 500 x 500 mm

Per hundred	2.50

C-13015 **Filter Paper—Whatman's No. 1** High-grade filter paper for filtering ordinary precipitates in industrial laboratories, when ash weight of paper is of no consequence, widely used for determination of phosphorus, circular, furnished 100 in sealed box

No.	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Diameter, mm	42 5	55	70	90	110	125	150	185	240	270	320	385	400	500
Per 100 ... Net	.16	.17	.20	.24	.28	.37	.51	.71	1 25	1.48	2.30	2 76	3.13	4.40

C-13020 **Filter Paper—Whatman's No. 1** Same quality as No C-13015 above, but furnished in sheets, 46 5 x 57 cm

Per ream of 480 sheets ... Net	20.25
Per 100 sheets ... Net	4.45

C-13025 **Filter Paper—Whatman's No. 2** Similar to No 1, but stouter, retains fine precipitates and filters rapidly

No.	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Diameter, mm	42 5	55	70	90	110	125	150	185	240	270	320	385	400	500
Per 100 ... Net	.20	.21	27	.34	.42	.52	.74	1.04	1.78	2.16	3.30	4 00	4.55	6.00

C-13030 **Filter Paper—Whatman's No. 2** Same quality as No. C-13025 above, but furnished in sheets

No.	A	B
Size, cm	46 5 x 57	58 5 x 58 5
Per ream of 480 sheets .. Net	31.10	40.00
Per 100 sheets ... Net	6.85	8.80

C-13065 **Filter Paper—Whatman's No. 40**—Double acid-washed all traces of silicious matter extracted by treatment with hydrochloric and hydrofluoric acids, very low ash, filters rapidly and retains fine precipitates.

No.	A	B	C	D	E	F	G
Diameter, mm	55	70	90	110	125	150	185
Per hundred ... Net	1.10	1.20	1.70	2.00	2.30	2.70	3.60

C-13067 **Filter Paper—Whatman's No. 41**—Double acid-washed but of more open texture than No 40 and therefore filtering more rapidly Desirable for silica, aluminum and iron determinations.

No.	A	B	C	D	E	F	G
Diameter, mm	55	70	90	110	125	150	185
Per hundred ... Net	1.10	1.20	1.70	2.00	2.30	2.70	3.60

Continued on Next Page

C-13070 **Filter Paper—Whatman's No. 43**—"Ashless" Double acid-washed, having been subjected to treatment by hydrochloric and hydrofluoric acids to extract all traces of silicious matter, also to an additional chemical process which renders it fat free, very low ash, filters rapidly and retains fine precipitates, suitable for the recovery of the ether extract in the Roese Gottlieb fat test, and for other purposes where the advantages of a fat-free paper are obvious, circular, furnished 100 in sealed box

	No.	A	B	C	D	E	F
Diameter, mm		55	70	90	110	125	150
Per 100	Net	1 35	1 50	2.20	2.25	2.28	3.60

C-13072 **Filter Paper — Whatman's No 44** Double acid-washed and of thinner structure than No 40 or No 43, with lowest possible ash content Recommended for use when greatest possible degree of accuracy is desired Slightly slower in filtration than No 40

	No.	A	B	C	D	E	F
Diameter, mm		55	70	90	110	125	150
Per 100 .	Net	1.35	1.50	2.20	2.55	2.80	3 60

C-13075 **Filter Paper—Whatman's No. 50** Specially hardened by treatment with nitric acid, very tough, resisting great pressure and retaining even finest precipitates, can be used repeatedly, hard, smooth surface permitting precipitates to be scraped or washed off without injury to paper; especially adapted for use with vacuum

	No.	A	B	C	D	E	F
Diameter, mm		42.5	55	70	90	110	125
Per 100	Net	.55	.90	1 20	1 70	2.00	2.30

	No.	G	H	I	J
Diameter mm		150	185	240	270
Per 100	Net	2 70	3.60	6.10	7.30

	No.	K	L	M	N
Diameter, mm		320	385	400	500
Per 100	Net	11.35	13 75	15.75	20.85

C-12973 **Filter Paper—Munktell's No. 00**- A double acid-washed filter paper of a specially low ash content for the most exacting work In packages of 100

	No.	A	B	C	D
Diameter, mm .		55	70	90	110
Per hundred ...	Net	1.50	1 65	2.40	3 00

	No.	E	F	G
Diameter, mm		125	150	185
Per hundred............	Net	3.30	3.75	6.30

C-12974 **Filter Paper Munktell's No. 0** Washed with hydrochloric acid, of very low ash content Will retain the finest precipitates although comparatively rapid filtering An excellent filter for general quantitative work

	No.	A	B	C	D
Diameter, mm		55	70	90	110
Per hundred	Net	.60	.81	1.26	1.65

	No.	E	F	H
Diameter, mm		125	150	185
Per hundred	Net	1.89	2.55	3.75

C-12975 **Filter Paper—Munktell's, No. 1F**—Unwashed paper of finest quality, very strong and adapted to highest class of chemical work; finest precipitates are retained; circular, furnished 100 in a package

	No.	A	B	C	D
Diameter, mm		55	70	90	110
Per hundred	Net	.33	.48	.75	.90

	No.	E	F	G
Diameter, mm		125	150	185
Per hundred...........	Net	1.20	1.50	2.25

C-12980 **Filter Paper—Munktell's, No. 1F**—Same quality as No C-12975 above, but furnished in full sheets, 48 x 48 cm.

Per ream of 480 sheets	Net	60.00
Per quire of 24 sheets	Net	3.60

C-12985 **Filter Paper—Munktell's, No. 2**—A pure, white linen paper of medium thickness, not so closely made and therefore more rapid in filtration; a superior paper for all laboratory work, circular, furnished 100 in a package

	No.	A	B	C	D
Diameter, mm		55	70	90	110
Per hundred	Net	.30	.39	.60	.78

	No.	E	F	G
Diameter, mm		125	150	185
Per hundred	Net	.93	1.20	1.59

C-12990 **Filter Paper—Munktell's, No. 2**—Same quality as No C-12985 above, but furnished in full sheets, 48 x 48 cm

Per ream of 480 sheets	Net	51.00
Per quire of 24 sheets	Net	3.00

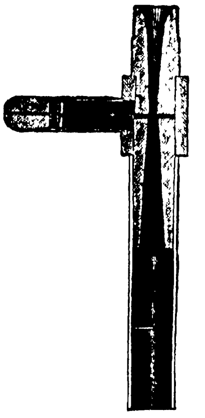
C-13078 **Filter Paper—A. D. Little**—A general purpose, quantitative filter paper, double acid-washed and of very low ash content Comparatively rapid but will retain very fine precipitates, uniformity absolute, in one grade only, in sealed boxes of 100 sheets

	No.	A	B	C	D	E
Diameter, mm		70	90	110	125	150
Per hundred ...	Net	1.20	1.70	2.00	2.30	2.70

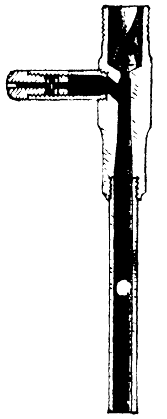
C-5780

C-5780 **Filter Plates**—Ohio porcelain, Hirsch, profusely perforated, edges beveled to fit 60° funnels

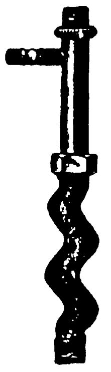
Size No.	1	2	3
Diameter, mm	25	38	50
Each	.17	22	.26



C-13090



C-13100



C-13105

C-13090 **Filter Pumps—Chapman's**—Made of brass and operated under ordinary water pressure; a very powerful pump

No.	1	2	3
Each	1.70	1.90	2.10

C-13095 **Filter Pumps—Chapman's, Couplings for**—When ordering, state size of pump for which coupling is desired.

No. A. For threaded faucet.

Each .... .40

No. B. For smooth faucet.

Each .... .60

C-13100 **Filter Pumps**—Constructed on entirely new design, to produce a higher vacuum in less time and using one-third less water than any other pump made.

No.	A	B	C
Size	Small	Medium	Large
Each	1.70	1.90	2.10

C-13105 **Filter Pumps—Richard's**—Made of brass and used with water pressure only; very powerful.

No.	A	B	C
Size	Small	Large	Extra Large
Each	1.70	3.00	8.50

Prices subject to change without notice

Continued on Next Page

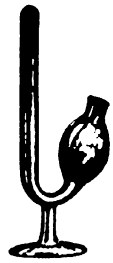
C-12830 **Extraction Shells—Alundum**—Constant in weight and may be used repeatedly May be cleaned by immersion in strong acid and ignition Can be supplied in three degrees of porosity

No.	A	B	C	D	E
Height, mm	90	70	80	100	55
Diameter, mm	19	25	30	34	35
Shape of bottom	Flat	Flat	Flat	Round	Flat
Each .. .Net	.60	.70	.75	.90	.80

C-12835 **Extraction Thimbles—Whatman's**—Made from the same high grade material as Whatman's Filter Paper and rendered fat free by a special process Absolutely seamless and can be used repeatedly Single and double thickness in sealed boxes of 25 thimbles

No.	A	B	C	D
Size, mm	19 x 50	19 x 90	22 x 80	26 x 60
Per box of 25, single thick	3.15	3.15	3 15	3.15
Per box of 25, double thick	5.28	5.28	5 28	5 28

No.	E	F	G	H
Size, mm	25 x 80	30 x 77	33 x 80	33 x 94
Per box of 25, single thick	3.55	3.55	3 55	4.40
Per box of 25, double thick	5.92	5.92	5.92	7.36



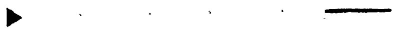
C 2710

C-12850 **Fermentation Tubes** On foot, ungraduated

No.	A	B	C
Length, mm	145	170	195
Diameter, mm	13	15	17
Each	.27	.32	36

Fermentation tubes of American Public Health Association Specifications as well as those without foot and with special graduation, can also be supplied Prices on request

C-12875



C 12880

C-12875 **Files—Round**—Rat-tail Best quality

No.	A	B	C	D
Length, mm	75	100	125	150
Each	.14	.16	.18	.20

C-12880 **Files—Triangular**—For cutting glass tubing, best quality

No.	A	B	C	D
Length, mm	75	100	125	150
Each	.12	.14	.15	.18

C-12885 **File Handles**—For use with the above

Each	.07
Per dozen	.75

FILTER PAPER

C-12940 **Filter Paper—Will, White**—Circular filters; put up in packages of 100 filters and found by test to be equal to higher priced papers.

No.	A	B	C	D	E	F
Diameter, mm	55	70	90	110	125	150
Per hundred..	.12	.15	.16	.21	.25	.32

No.	G	H	I	J	K
Diameter, mm	185	240	270	320	385
Per hundred..	.40	.75	1.00	1.20	1.55

C-12945 **Filter Paper—Will, White**—In sheets, 480 x 480 mm.

Per hundred	2.80

C-12950 **Filter Paper—Will, Gray** Circular filters, tough and durable

No.	A	B	C	D
Diameter, mm	150	190	250	330
Per hundred	40	.50	.85	1.10

No.	E	F	G
Diameter, mm	400	450	500
Per hundred	1 50	2.20	2.70

C-12955 **Filter Paper—Will, Gray** In sheets, 500 x 500 mm

Per hundred	2.50

C-13015 **Filter Paper—Whatman's No. 1** High-grade filter paper for filtering ordinary precipitates in industrial laboratories, when ash weight of paper is of no consequence, widely used for determination of phosphorus, circular, furnished 100 in sealed box

No.	A	B	C	D	E	F
Diameter, mm	42 5	55	70	90	110	125
Per 100...Net	.16	.17	.20	.24	.28	.37

No.	G	H	I	J
Diameter, mm	150	185	240	270
Per 100...Net	.51	.71	1 25	1.48

No.	K	L	M	N
Diameter, mm	320	385	400	500
Per 100...Net	2.30	2 76	3.13	4.40

C-13020 **Filter Paper—Whatman's No. 1** Same quality as No C-13015 above, but furnished in sheets, 46 5 x 57 cm

Per ream of 480 sheets ....Net	20.25
Per 100 sheets...Net	4.45

C-13025 **Filter Paper—Whatman's No. 2** Similar to No 1, but stouter, retains fine precipitates and filters rapidly

No.	A	B	C	D	E	F
Diameter, mm	42 5	55	70	90	110	125
Per 100...Net	.20	.21	27	.34	.42	.52

No.	G	H	I	J
Diameter, mm	150	185	240	270
Per 100. Net	.74	1.04	1.78	2.16

No.	K	L	M	N
Diameter, mm	320	385	400	500
Per 100. Net	3.30	4 00	4.55	6.00

C-13030 **Filter Paper—Whatman's No. 2** Same quality as No. C-13025 above, but furnished in sheets

No.	A	B
Size, cm	46 5 x 57	58 5 x 58 5
Per ream of 480 sheets..Net	31.10	40.00
Per 100 sheets.....Net	6.85	8.80

C-13065 **Filter Paper—Whatman's No. 40**—Double acid-washed all traces of silicious matter extracted by treatment with hydrochloric and hydrofluoric acids, very low ash, filters rapidly and retains fine precipitates.

No.	A	B	C	D
Diameter, mm	55	70	90	110
Per hundred.....Net	1.10	1.20	1.70	2.00

No.	E	F	G
Diameter, mm	125	150	185
Per hundred.....Net	2.30	2.70	3.60

C-13067 **Filter Paper — Whatman's No. 41** — Double acid-washed but of more open texture than No 40 and therefore filtering more rapidly Desirable for silica, aluminum and iron determinations.

No.	A	B	C	D
Diameter, mm	55	70	90	110
Per hundred.....Net	1.10	1.20	1.70	2.00

No.	E	F	G
Diameter, mm	125	150	185
Per hundred.....Net	2.30	2.70	3.60

Prices subject to change without notice

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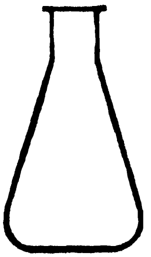
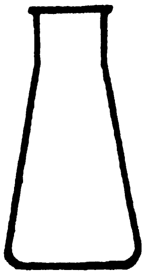

C-2805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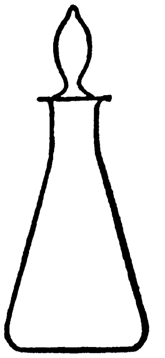

C-2820

C-2805 Flasks—Erlenmeyer—Pyrex.

No.	A	B	C	D	E	F
Capacity, cc	25	50	100	150	200	250
For rubber stopper No	00	1	3	4	5	5
No orig case	300	276	180	252	144	132
Each . Net	.16	.16	.18	.18	.20	.22

In full case lots, less 10% discount.

No.	G	H	I	J	K	L
Capacity, cc	300	500	600	750	1000	1500
For rubber stopper No.	6	6	6	7	8	9
No orig case	132	72	60	48	36	24
Each ....Net	.25	.29	.31	.34	.42	.51

In full case lots, less 10% discount

No.	M	N	O	P
Capacity, cc .	2000	3000	4000	6000
For rubber stopper No	10	10	10	10
No orig case	24	15	12	6
Each . . .Net	.60	.79	1.00	1.60

In full case lots, less 10% discount

C-2810 Flasks—Erlenmeyer—Resistance Glass.

No.	F	J	L	N	O
Capacity, cc	200	500	1000	2000	3000
Each	.22	.30	.44	.62	.80

C-2815 Flask—Erlenmeyer—Pyrex- With wide mouth

No.	A¹	A²	A	B
Capacity, cc .	50	100	250	500
For rubber stopper No..	6	7	8	10
No in original case	216	216	132	60
Each .... Net	.16	.18	.22	.29

In full case lots, less 10% discount

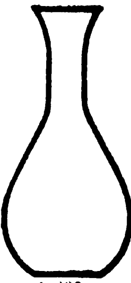
No.	C	D	E
Capacity, cc	750	1000	2000
For rubber stopper No ..	10	11	13
No in original case	48	36	24
Each . ... Net	.34	.42	.60

In full case lots, less 10% discount

C-2820 Flasks — Erlenmeyer — Resistance Glass — With ground-in, glass stopper

No.	A	B	C
Capacity, cc	125	250	500
Each	.36	.48	.60

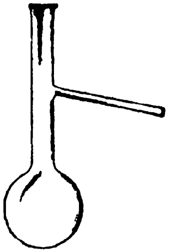
These can also be supplied in Pyrex glass Prices on application


C-2835

C-2835 Flasks — Copper Determination — Pyrex—With cylindrical neck and flaring top

No.	A	B
Capacity, cc	180	250
For rubber stopper No	5	6
No in original case.........	144	108
Each .... Net	.25	.30

In full case lots, less 10% discount.


C-2845-80

C-2845 Flasks—Distilling—Pyrex—With side tube at center of neck

No.	A	B	C	D	E
Capacity, cc .	25	50	100	125	200
No. in original case.	84	60	54	48	54
For rubber stopper No	1	1	2	3	3
Each . . Net	.36	.40	.45	.50	.55

In full case lots, less 10% discount

No.	F	G	H	H¹	I
Capacity, cc	250	300	500	700	1000
No in original case	24	36	21	15	12
For rubber stopper No.	3	4	4	6	6
Each . . Net	.60	.65	.70	1.00	1.18

In full case lots, less 10% discount

No	J	K	L
Capacity, cc	1500	2000	3000
No in original case.	9	6	6
For rubber stopper No	7	9	10
Each ... .. Net	1.45	1.60	2.15

In full case lots, less 10% discount

These flasks can be supplied with side tube either high or low on neck if specified at same prices

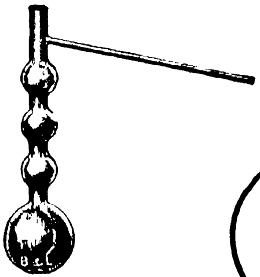
C-2880 Flasks—Distilling—Engler's—Pyrex—For oil distillation, of standard dimensions

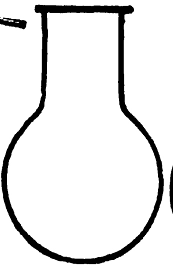
No.	A	B	C
Capacity, cc	100	200	250
For rubber stopper No	1	2	2
No in original case	54	48	48
Each . . . . Net	.60	.65	.70

In full case lots, less 10% discount

C-2891 Flask — Distilling — Ladenburg's—Pyrex

No.	A	B	C
Capacity cc	125	250	500
Each Net	1.20	1.70	2.40


C-2891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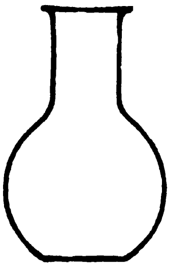

C-2925

C-2920 Flasks — Extraction — Pyrex—Round bottom; with wide neck and vial mouth.

No.	A	B
Capacity, cc..........................	100	2000
For rubber stopper No................	6	13
No. in original case.......	120	18
Each ....Net	.18	.69

In full case lots, less 10% discount

C-2925 Flasks—Extraction—Pyrex—Flat bottom, with wide neck and vial mouth.

No.	A	B	C	D
Capacity, cc	50	100	150	250
For rubber stopper No....	6	6	7	8
No in original case......	168	120	108	120
Each ....Net	.16	.18	.19	.20

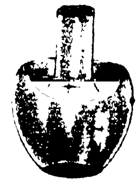
In full case lots, less 10% discount.

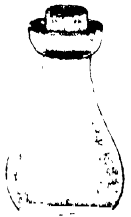
Prices subject to change without notice

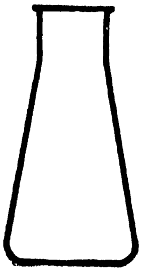
Continued on Next Page

No.	E	F	G	H
Capacity, cc	500	750	1000	2000
For rubber stopper No	10	10	11	13
No in original case	60	48	36	18
Each . . . Net	.29	.36	.54	.98

In full case lots, less 10% discount


C-2935


C-2940


C 2945

C-2935 Flask—Extraction—Knorr's —With indentation for mercury seal

No.	A
Capacity, cc	100
Each	.65

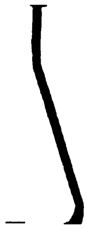
C-2940 Flasks—Extraction—Sy's With trough for mercury seal, with large neck to facilitate cleaning

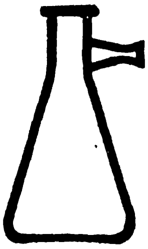
No.	A	B	C	D
Capacity, cc	100	150	200	250
Each	.80	1.05	1.15	1.30

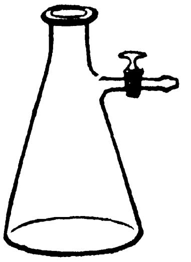
C-2945 Flasks — Rubber Extraction — Pyrex Capacity 400 cc, for rubber stopper No 9, 72 in original case

Each .... Net .32

In full case lots, less 10% discount


C-2950


C-2960


C-2970

C-2950 Flasks — Filtering — Pyrex — Erlenmeyer form; of heavy glass to withstand pressure

No.	A	B	C	D	E
Capacity, cc	250	500	1000	2000	4000
For rubber stopper No	6	6	7	9	9
No in original case	120	72	30	20	9
Each ....Net	.40	.54	.84	1.20	2.00

In full case lots, less 10% discount

C-2960 Flasks—Filtering—Pyrex—Of heavy glass to withstand pressure, with side neck

No.	A	B	C	D	E
Capacity, cc	250	500	1000	2000	4000
For rubber stopper No	6	6	7	9	9
No in original case	96	60	24	15	16
Each ....Net	.70	.95	1.45	2.40	4.00

In full case lots, less 10% discount

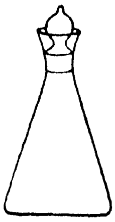
C-2965 Flasks—Filtering—Same as No. C-2960 above, but of resistance glass.

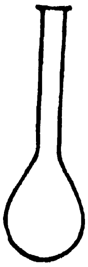
No.	A	B	D	E	F
Capacity, cc	250	500	1000	2000	4000
Each ....Net	.56	.76	1.16	1.92	3.20

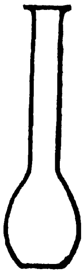
Prices subject to change without notice

C-2970 Flasks—Filtering—Same as No C-2965 above, but with side neck fitted with glass stopcock.

No.	A	B	C	D
Capacity, cc	250	500	1000	2000
Each	1.40	1.70	2.80	4.00


C-2985


C 2990


C-2995

C-2985 Flasks—For iodine determinations

No.	A	B	C
Capacity, cc	125	250	500
Each	1.00	1.20	1.50

C-2990 Flasks — Kjeldahl's — Pyrex Round bottom, with long neck

No.	A	B	C	D
Capacity, cc	300	500	650	800
Length over all, mm	290	320	320	380
For rubber stopper No.	5	6	6	7
No in original case	60	36	36	36
Each .Net	.28	.37	.42	.45

In full case lots, less 10% discount.

C-2995 Flasks—Kjeldahl's—Pyrex Flat bottom, with long neck

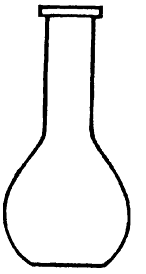
No.	A	B
Capacity, cc	300	500
Length over all, mm	260	300
For rubber stopper No	5	6
No in original case	60	36
Each .... Net	.28	.37

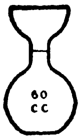
In full case lots, less 10% discount

C-3000 Flasks — Kjeldahl's — Pyrex Round bottom; with short neck

No.	A	B	C
Capacity, cc	300	500	800
Length over all, mm	230	240	275
For rubber stopper No	5	6	7
No in original case	60	36	36
Each ....Net	.28	.37	.45

In full case lots, less 10% discount


C 3020



C-3036

C-3020 Flasks — Johnson's—Pyrex — For sulfur determination in iron and steel analysis, with heavy, ring neck, capacity, 275 cc; for rubber stopper No 6; number in original case, 108

Each ....Net .32

In full case lots, less 10% discount

C-3036 Flask — Viscosimeter — Of Pyrex glass, graduated; with mark at 60 cc.

Each 1.25

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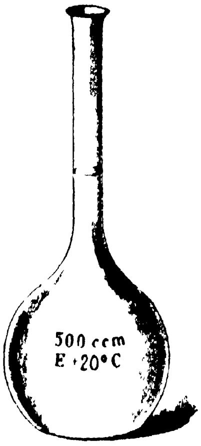
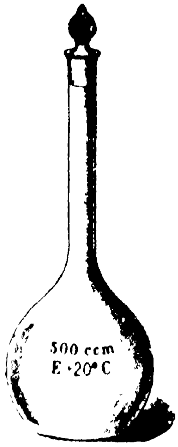


C 3040



C 3070

C-3040 Flasks—Volumetric Accurately graduated with one mark on neck

No.	A	B	C	D	E	F
Capacity, cc	5	10	25	50	100	200
Each	30	30	27	32	42	44
No	**G**	**H**	**I**	**J**		
Capacity, cc	250	300	500	1000		
Each	50	55	70	90		
No.	**K**	**L**	**M**			
Capacity, cc	2000	3000	6000			
Each	1.60	3.00	5.00			

These can also be supplied in Pyrex glass
Prices on application

C-3045 Flasks—Volumetric Graduated to meet the requirements of the U. S. Bureau of Standards, adjusted for containing

No.	A	B	C	D	E	F
Capacity, cc	50	100	250	500	1000	2000
Each	1.45	1.80	2.15	2.70	4.00	4.70

C-3050 Flasks—Volumetric Same as No **C-3045** above, but adjusted for delivering

No.	A	B	C	D	E	F
Capacity, cc	50	100	250	500	1000	2000
Each	1.45	1.80	2.15	2.70	4.00	4.70

C-3065 Flasks—Volumetric Same as No **C-3040** above, but with ground-glass stopper

No.	A	B	C	D	E	F
Capacity, cc	5	10	25	50	100	200
Each	50	.50	42	.50	.72	75
No.	**G**	**H**	**I**	**J**		
Capacity, cc	250	300	500	1000		
Each	80	85	.95	1.10		
No.	**K**	**L**	**M**			
Capacity, cc	2000	3000	6000			
Each	1.80	3.50	5.75			

These can also be supplied in Pyrex glass
Prices on application

C-3070 Flasks—Volumetric—With ground-glass stopper, graduated to meet the requirements of the U. S. Bureau of Standards, adjusted for containing

No.	A	B	C	D	E	F
Capacity, cc	50	100	250	500	1000	2000
Each	1.95	2.50	3.25	4.00	5.40	6.50

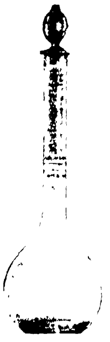
C-3075 Flasks—Volumetric—Same as No **C-3070** above but adjusted for delivering

No.	A	B	C	D	E	F
Capacity, cc	50	100	250	500	1000	2000
Each	1.95	2.50	3.25	4.00	5.40	6.50

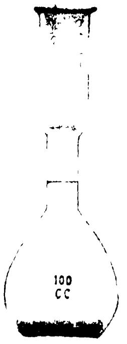
C-3095 Flasks—Volumetric with two marks on neck, graduated for containing and delivering exact quantities, with ground-glass stopper

No.	C	E	F	G	H
Capacity, cc	100	250	500	1000	2000
Each	1.10	1.15	1.50	1.70	2.25

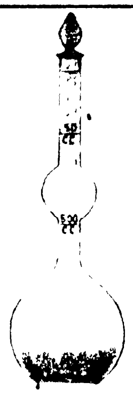
Prices subject to change without notice



C 3095



C 3110



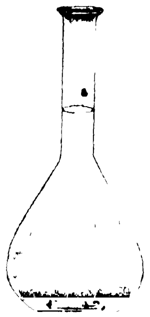
C 3115

C-3110 Flasks—Volumetric—Giles' With two graduation marks and ground glass stopper, when used for making normal solutions the 10% extra volume in the neck of the flask is used for ascertaining exact titration, leaving a volume equivalent to the exact capacity of flask for correction

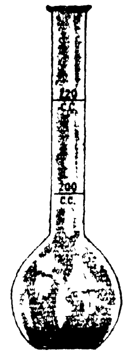
No	B	C	D
Capacity, cc	100 110	250 275	500 550
Each	1.50	1.75	1.95
No	**E**	**F**	
Capacity, cc	1000 1100	2000 2200	
Each	2.70	4.00	

C-3115 Flasks—Volumetric—Kohlrausch's For saccharometric polarization, graduated

No.	B	D	E	F
Capacity, cc	100	200	200.6	201.2
Each	.45	75	.75	75
No.	**G**	**H**	**I**	
Capacity, cc	201.4	400	500	
Each	.75	1.15	1.30	



C-3130

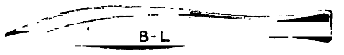


C-3135

C-3130 Flasks—Sugar—Bates'—Pear-shaped, with flaring top, capacity, 100 cc
Each .55

C-3135 Flasks—Sugar—With two graduations, without glass stopper.

No.	A	B	C
Capacity, cc	50 and 55	100 and 110	200 and 220
Each	.34	.42	.60



C-13238

C-13230	**Forceps**—Of brass; straight Each	.35
C-13232	**Forceps**—Same as No **C-13230**, but nickel-plated Each	.35
C-13238	**Forceps**—Of brass; bent Each	.35
C-13240	**Forceps**—Same as No **C-13238**, but nicked-plated. Each	.35

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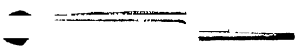
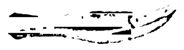


C 13255



C 13245

C-13245 **Forceps**—Of brass, with ivory tips

Each	1.00

C-13255 **Forceps**—Of steel, plain

No	A	B	C	D
Length, mm	75	100	125	150
Each	.13	.13	.15	.17

C-13260 **Forceps—Platinum-Tipped** Nickel plated with heavy platinum shoes length 170 mm

Price on application

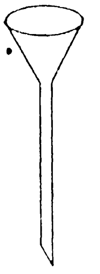
FUNNELS

C-3140 **Funnels**—Of clear white glass, with stem ground to point angle 60°

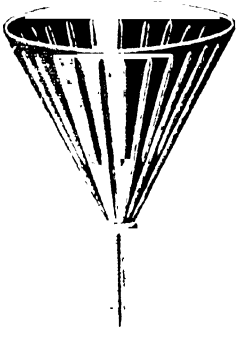
No	A	B	C	D	E	F
Diameter, mm	25	30	40	50	65	75
Each	.20	.20	.20	.23	.24	.27

No	G	H	I	J	K
Diameter, mm	90	100	110	120	150
Each	.29	.32	.38	.44	.55

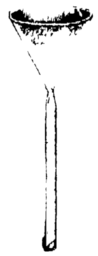
No	L	M	N	O	P
Diameter, mm	175	200	225	250	300
Each	.75	.85	1.35	1.70	3.25



C 3145



C 3155



C-3150

C-3145 **Funnels—Bunsen's** Of clear, white glass, having an exact angle of 60°, with long thin stems ground to point, for use with rubber stopper in filtering flask, with ground rim

No	A	B	C	D	E
Diameter, mm	25	40	50	65	75
Each	.20	.20	.23	.24	.27

No	F	G	H	I	J
Diameter, mm	90	100	110	120	150
Each	.29	.32	.38	.44	.55

C-3150 **Funnels—Bunsen's**—Of clear, white glass, with constriction in top of stem, facilitating rapid filtration, with stem ground to point, angle, 60°

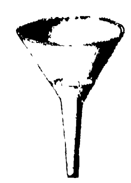
No.	A	B	C	D
Diameter, mm	50	65	75	100
Each	.25	.27	.30	.35

C-3155 **Funnels**—Of clear, white glass, ribbed, designed for rapid filtration, with stem ground to point, angle, 60°

No.	A	B	C	D	E
Diameter, mm	65	70	90	120	150
Capacity, cc	25	50	125	250	500
Each	.18	.19	.20	.30	.45

No.	F	G	H	I
Diameter, mm	180	220	255	325
Capacity, cc	1000	2000	4000	8000
Each	.62	1.00	1.55	3.35

Prices subject to change without notice



C 5795 5800 C 5805

C-5795—Funnels—Buchner Coors porcelain, with fixed perforated plate and straight walls

No	0	1	2	2a
Diameter, mm	48	66	82	102
Height, mm	76	100	110	165
Distance, plate from rim, mm	17	25	37	46
Each Net	.90	1.08	1.80	2.34

No	3	4	4a	5
Diameter, mm	122	138	163	200
Height, mm	195	215	234	280
Distance, plate from rim, mm	57	61	66	75
Each Net	2.52	4.32	5.04	6.48

C-5800 **Funnels—Buchner** Ohio porcelain with fixed perforated plate and straight walls

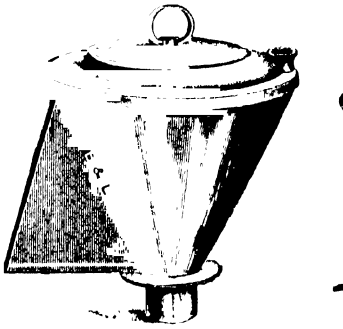
No	1	2	3	4
Diameter, mm	40	60	80	100
Height of walls, mm	20	25	30	40
Each	.65	.85	1.10	1.50

No	5	6	7	8
Diameter, mm	150	200	250	300
Height of walls, mm	60	90	100	120
Each	2.30	4.70	7.25	12.00

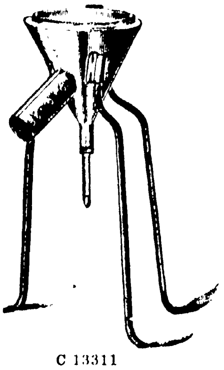
C-5805 **Funnels—Hirsch** Coors porcelain with fixed perforated plate

No	000	00	0	1
Diameter, mm	50	75	92	103
Height, mm	61	95	121	131
Diameter perforated plate, mm	28	28	28	28
Distance plate from rim, mm	12	18	33	41
Each Net	.72	.90	1.08	1.44

No	2	3	4
Diameter, mm	120	140	163
Height, mm	158	185	217
Diameter perforated plate, mm	45	45	60
Distance plate from rim, mm	45	62	69
Each Net	1.80	2.52	3.24



C-13303 07



C 13311

C-13303 **Funnel—Hot Water** According to Plantamour, double walled, of copper

Each 7.00

C-13307 **Funnel—Hot—Water** According to Plantamour, double-walled, of tin

Each 5.00

C-13311 **Funnel—Hot Water** Of heavy, polished copper, double-walled; mounted on three iron legs

Each 6.75

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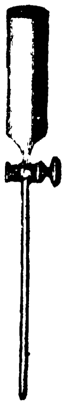
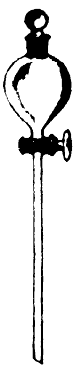
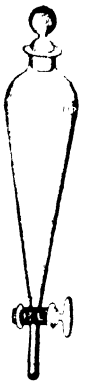
C 3175


C 3180


C-3185


C 3205

C-3175 Funnels—Separatory—Open top, bell shape

No.	A	B	C	D
Capacity, cc	25	50	75	100
Each	.72	.90	1.00	1.15

C-2180 Funnels—Separatory—Open top, cylindrical

No.	A	B	C	D
Capacity, cc	30	60	100	125
Each	75	.87	1.05	1.15

No.	E	F	G
Capacity, cc	150	200	250
Each	1.20	1 25	1.35

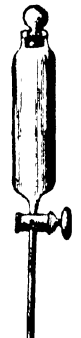
C-3185 Funnels—Separatory—With ground, glass stopper; pear shape

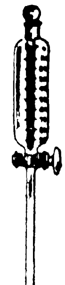
No.	A	B	C	E
Capacity, cc	30	60	125	250
Each	.87	.93	1.15	1.40

No.	G	H	I	J
Capacity, cc	500	750	1000	2000
Each	1.70	1.95	2.40	3.90

C-3205 Funnels—Separatory—Squibb's—With ground, glass stopper

No.	A	B	C	D	E
Capacity, cc	125	250	500	1000	2000
Each	1.05	1.55	1.95	2.95	4.70


C-3225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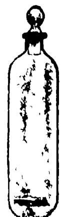

C-3235

C-3225 Funnels—Separatory—With ground, glass stopper; cylindrical; ungraduated

No.	B	C	D	E
Capacity, cc	60	125	250	300
Each	.93	1.15	1.50	1.70

No.	F	G	H
Capacity, cc	500	1000	1250
Each	1.80	2.40	2.85

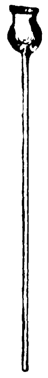
Prices subject to change without notice

C-3230 Funnels—Separatory—With ground, glass stopper; cylindrical, graduated.

No.	A	B	C	D
Capacity, cc	125	250	500	1000
Each	1.85	2.85	3.50	4.70

C-3235 Funnels—Separatory—Of stout glass, with ground, glass stopper and short stem, cylindrical

No.	A	B
Capacity, cc	500	1000
Each	2.25	2.95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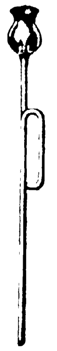
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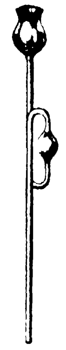
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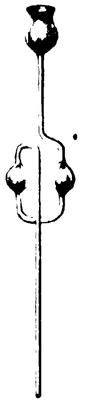
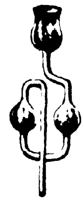

C-3270


C-3275

C-3245 Funnel Tubes—Straight, thistle top

No.	A	B	C	D
Length, mm	200	250	300	400
Each	.09	.10	.10	.11

C-3255 Funnel Tubes—With loop, thistle top

No.	A	B	C
Length, mm	200	300	400
Each	.22	.22	.27

C-3265 Funnel Tube—With loop and one bulb, thistle top; length, 300 mm

Each .... .28

All of above funnel tubes can be supplied with conical tops if desired

C-3270 Funnel Tube—With double loop and two bulbs; thistle top; length, 300 mm

Each 35

C-3275 Funnel Tube—With double loop and two bulbs near top, thistle top; with short stem, length, 300 mm

Each .... .37

C-390

C-390 Furnace—Crucible and Muffle Combined—Chamber 2 in diameter by 2½ in deep, can be heated to 1000°C in approximately thirty minutes. Furnace can be used in upright position or on special wire stand in horizontal position. Complete with connecting cord and plug.

Each ....Net 28.00

(Please state voltage and current when ordering.)

C-391 Furnace, Crucible and Muffle Combined—Same as No C-390, but with rheostat.

Each ....Net 40.00

Gas and oil heated furnaces can also be supplied. Send us your specifications.

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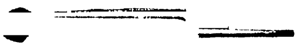
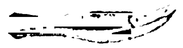


C 13255



C 13245

C-13245 **Forceps**—Of brass, with ivory tips
Each 1 00

C-13255 **Forceps**—Of steel, plain

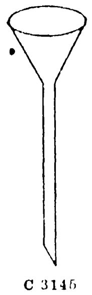
No	A	B	C	D
Length, mm	75	100	125	150
Each	13	13	15	17

C-13260 **Forceps—Platinum-Tipped** Nickel plated with heavy platinum shoes length 170 mm
Price on application

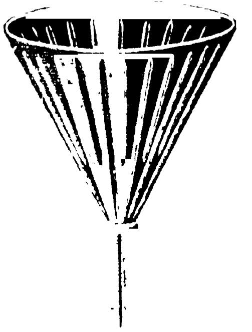
FUNNELS •

C-3140 **Funnels** Of clear white glass, with stem ground to point angle 60

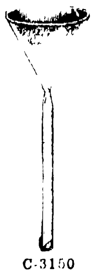
No	A	B	C	D	F	F
Diameter mm	25	30	40	50	65	75
Each	20	20	20	23	24	27
No	**G**	**H**	**I**	**J**	**K**	
Diameter mm	90	100	110	120	150	
Each	29	32	38	44	55	
No	**L**	**M**	**N**	**O**	**P**	
Diameter, mm	175	200	225	250	300	
Each	75	.85	1 35	1 70	3 25	



C 3145



C 3155



C-3150

C-3145 **Funnels—Bunsen's** Of clear, white glass, having an exact angle of 60°, with long thin stems ground to point, for use with rubber stopper in filtering flask, with ground rim

No	A	B	C	D	E
Diameter, mm	25	40	50	65	75
Each	20	.20	23	24	27
No	**F**	**G**	**H**	**I**	**J**
Diameter, mm	90	100	110	120	150
Each	.29	32	.38	44	55

C-3150 **Funnels—Bunsen's**—Of clear, white glass, with constriction in top of stem, facilitating rapid filtration, with stem ground to point, angle, 60°

No.	A	B	C	D
Diameter, mm	50	65	75	100
Each	.25	.27	.30	.35

C-3155 **Funnels**—Of clear, white glass, ribbed, designed for rapid filtration, with stem ground to point, angle, 60°

No.	A	B	C	D	E
Diameter, mm	65	70	90	120	150
Capacity, cc	25	50	125	250	500
Each	.18	.19	.20	30	.45
No.	**F**	**G**	**H**	**I**	
Diameter, mm	180	220	255	325	
Capacity, cc	1000	2000	4000	8000	
Each	.62	1.00	1.55	3.35	

C 5795 5800

C 5805

C-5795—Funnels—Buchner Coors porcelain, with fixed perforated plate and straight walls

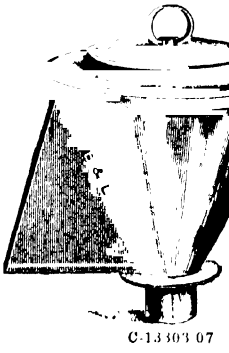
No	0	1	2	2a
Diameter mm	48	66	82	102
Height, mm	76	100	110	165
Distance, plate from rim mm	17	25	32	46
Each Net	90	1 08	1 80	2 34
No	**3**	**4**	**4a**	**5**
Diameter mm	122	138	163	200
Height, mm	195	215	234	280
Distance plate from rim mm	47	61	66	75
Each Net	2 52	4 32	5 04	6.48

C-5800 **Funnels Buchner** Ohio porcelain with fixed perforated plate and straight walls

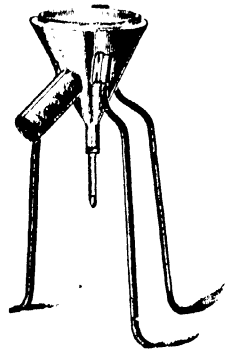
No	1	2	3	4
Diameter, mm	50	60	80	100
Height of walls mm	20	25	30	40
Each	65	85	1 10	1 50
No	**5**	**6**	**7**	**8**
Diameter, mm	150	200	250	300
Height of walls mm	60	90	100	120
Each	2 30	4 70	7 25	12 00

C-5805 **Funnels—Hirsch** Coors porcelain with fixed perforated plate

No	000	00	0	1
Diameter, mm	50	75	92	103
Height, mm	61	95	121	131
Diameter perforated plate mm	28	28	28	28
Distance plate from rim mm	12	18	33	41
Each Net	72	90	1 08	1.44
No	**2**	**3**	**4**	
Diameter, mm	120	140	163	
Height, mm	158	185	217	
Diameter perforated plate mm	45	45	60	
Distance plate from rim mm	45	62	69	
Each Net	1 80	2.52	3.24	



C-13303 07



C 13311

C-13303 **Funnel—Hot Water** According to Plantamour, double walled, of copper
Each 7 00

C-13307 **Funnel—Hot—Water** According to Plantamour, double-walled, of tin
Each 5.00

C-13311 **Funnel—Hot Water** Of heavy, polished copper, double-walled; mounted on three iron legs
Each 6.75

Prices subject to change without notice

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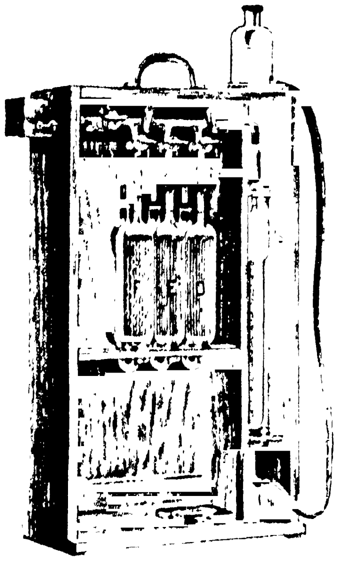
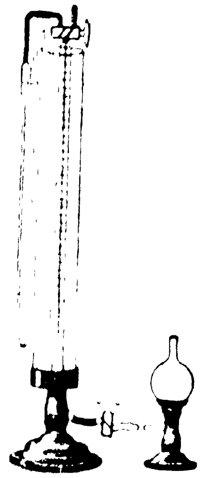


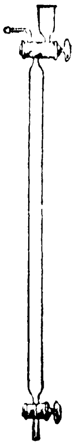
C 3375 SEE PAGE 1021



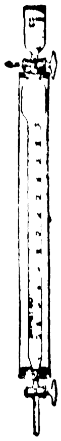
C 3560

C-3560 Gas Burette—Hempel's With correction for temperature and pressure, for measurement of gas volumes between 0 5 and 100 cc , with stopcock and leveling bulb

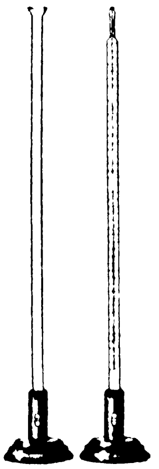
Each .	16 50



C-3540



C-3545



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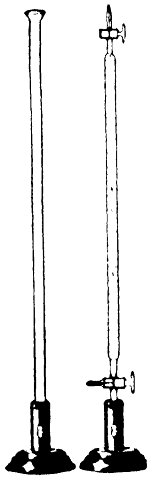


C-3570

C-3540 Gas Burette — Bunte's Without water jacket, graduated to 50 cc in 1/10 cc steps, with two stopcocks

Each . . .	3.40

C-3545 Gas Burette—Bunte's—Same as No C-3540 above, but with water jacket, fitted with rubber stopper

Each . . .	4 20

C-3550 Gas Burette—Hempel's—Consists of one tube graduated to 100 cc in 1 5 cc steps and one plain tube, mounted on weighted, wooden bases

Per set	4.50

C-3570 Gas Burette — Hempel-Winkler's — Same as No C-3550 above, but with graduated tube fitted with glass stopcocks, as illustrated

Per set	6.00

C-3595

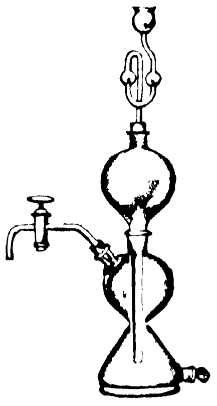
C 3600

C-3595 Gas Collecting Tube—U. S Bureau of Mines Form – With two stopcocks and sealed in tube

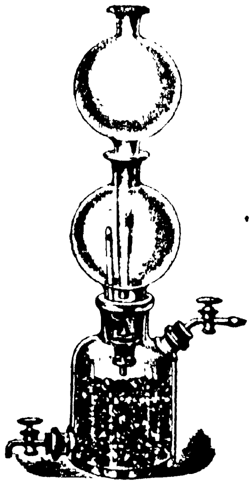
Each . .	4 00

C-3600 Gas Collecting Tube—Thoerner's Long form, with two stopcocks, capacity, about 125 cc

Each	2.25



C-3640



C-3647

C-3640 Gas Generators—Kipp's Improved form, for the continued generation of hydrogen sulfide, with large side opening for filling, complete with Geissler's stopcock, funnel tube, etc

No.	A	B	C	D	E
Generator size, cc	250	500	1000	1500	2000
Each	6.80	7.50	11 00	12 50	14.50

C-3645 Perforated Rubber Plates—For holding the iron sulfide in the above generator, No C-3640, from falling into the lower chamber

No.	A	B	C	D	E
Generator size, cc	250	500	1000	1500	2000
Each	.20	.25	.30	.35	.40

C-3647 Gas Generator—McCoy's—For continuous generation of gases Very easily cleaned

No.	A	B	C	D
Capacity, cc ..	500	1000	1500	2000
Each	7.50	11.00	12.50	14.50

C-3675

C-3675 Gas Leveling Bulb—For use in gas analysis and other purposes, mounted on iron stand

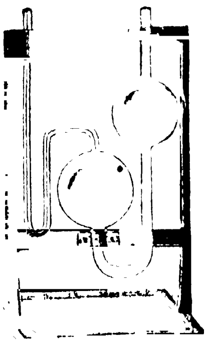
Each	2.20

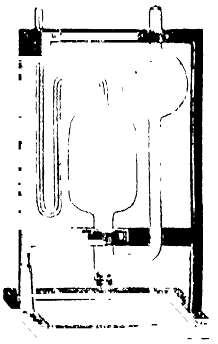
C-3680 Glass Bulb only.

Each	.90

Continued on Next Page

Gas Pipettes — Hempel's Mounted on latest improved iron supports, the glass parts being fastened to the stands by means of adjustable metallic clamps with cork inserts instead of being cemented to wooden or metal frames with plaster of paris, as in older forms. In this form of stand it is possible to attach new glass parts very quickly, the adjustable clamps compensating for any slight variation in the shape or dimensions of the pipette


C 3700

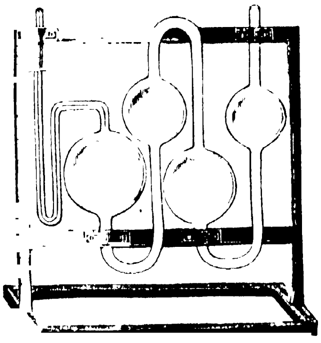

C 3705

C-3700 Gas Pipette — Hempel's Simple absorption for liquid reagents
Each 4 00

Glass Parts only
Per set 2 00

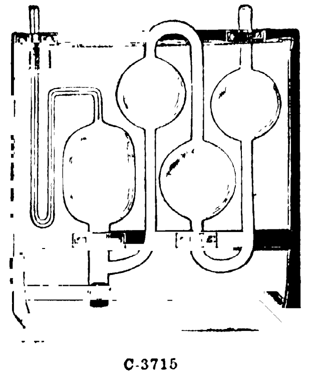
C-3705 Gas Pipette -- Hempel's Simple absorption for liquid and solid reagents
Each 4 25

Glass Parts only
Per set 2 25


C 3710

C-3710 Gas Pipette — Hempel's — Double absorption, for liquid reagents
Each 5 00

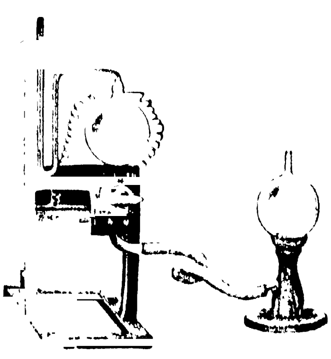
Glass Parts only
Per set 2.75

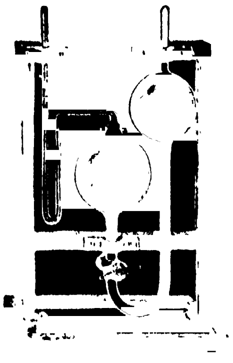

C-3715

Prices subject to change without notice

C-3715 Gas Pipette—Hempel's Double absorption, for solid and liquid reagents
Each 5.25

Glass Parts only
Per set 3.00


C 3730

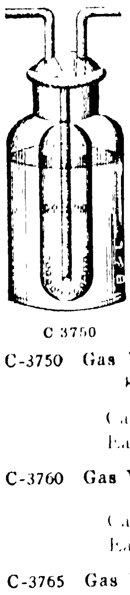

C 3735

C 3730 Gas Pipette—Hempel's Explosion, with platinum electrodes, stopcock and leveling bulb
Each 9 00

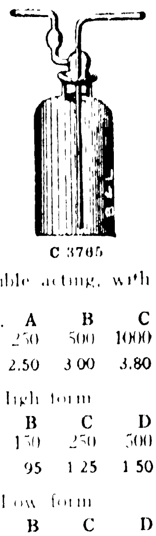
Glass Parts only
Per set 5 00

C-3735 Gas Pipette — Hempel's Simple explosion with platinum electrodes and stopcock
Each 7 00

Glass Parts only
Per set 5 00


C 3750

C 3760


C 3765

C-3750 Gas Washing Bottle—Allihn's Double acting, with ground in stopper

No.	A	B	C
Capacity, cc	250	500	1000
Each	2.50	3 00	3.80

C-3760 Gas Washing Bottles—Drechsel's High form

No	A	B	C	D
Capacity, cc	100	150	250	500
Each	.85	95	1 25	1 50

C-3765 Gas Washing Bottles--Drechsel's Low form

No.	A	B	C	D
Capacity, cc	100	150	250	500
Each	85	.95	1 25	1 50

C-13345 Gas—Carbon Dioxide In 20 lb cylinders
Per lb .40
Cylinders extra and returnable prepaid
Each . . . . Net 18 00

C-11385 Gas—Sulfur Dioxide In 8 10 lb cylinders including cylinders
Each . . . . . Net 27.00
Cylinders refillable, but not returnable for credit.
Each . . . . Net 10.00

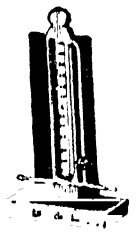
Continued on Next Page

C-13380 Gas—Oxygen—In 40 gal cylinders filled
Net 12.00
Cylinders returnable prepaid
Each . . . . Net 8.00

C-20225 Gas—Hydrogen In cylinders of 160 cu ft capacity at 2000 pounds pressure, without cylinders
Each . . . . Net 10.00
Gas Hydrogen As above including cylinders
Each . . . . Net 40.00
Cylinders returnable prepaid for credit
Each . . . . Net 30.00

A rental charge of 25 c per week will be made against each cylinder not returned to us or to the nearest International Oxygen Co station within a month of date of shipment

C-3795


C-3800

C-3795 Gauge — Vacuum (Manometer) —Consists of glass U-tube on wooden support, with scale, without mercury.
Each 2.50

C-3800 Gauge — Vacuum (Manometer)—Bennert's —With glass stopcock and movable scale engraved on wood; without mercury
Each 12.00

C-3810 Glass Beads Used to create a large surface for absorption of gases, or to prevent bumping, with hole through center, length, 5 to 6 mm., diameter, 3 to 8 mm
Per lb. 2.00

C-3811 Glass Beads—Solid; diameter 4 to 5 mm
Per lb. 2.50

GLASS TUBING

C-3815 Glass Tubing—Of best quality, soft glass, medium wall thickness; in 5-foot lengths (If full lengths are desired, such must be specified; otherwise shorter lengths, more convenient for packing, will be supplied)

No.	A	B	C	D
Diameter, outside, mm	1½-2½	2½-3½	3-4	5-6
Per lb	1.20	1.00	.70	.50

No.	E	F	G	H
Diameter, outside, mm	7-8	8-10	10-11	12-14
Per lb	.45	.40	.35	.32

No.	I	J	K	N
Diameter, outside, mm	15-21	22-25	26-30	31-35
Per lb	.28	.32	.26	.28

No.	O	P
Diameter, outside, mm	36-44	45-51
Per lb	.35	.42

C-3820 Glass Tubing — Pyrex — Standard Wall — Of same composition as Pyrex chemical ware; recommended where sudden changes of temperature and mechanical strength are necessary; supplied in 3-foot lengths.

No.	A	B	B-1
Approx diam, outside, mm	4.76	6.35-9.13	9.52-12.3, incl.
Approx wall thickness, mm	0.8	1.0	1.2
Per lb. . . . . Net	1.00	.90	.80

No.	C	D	E
Approx diam, outside, mm	12.7-21.8	22.2-31.4	31.8-37.7, incl.
Approx wall thickness, mm	1.6	2.0	2.4
Per lb. . . . . Net	.90	.96	1.10

No.	F	G	I
Approx diam, outside, mm	38.1-50.4	50.8-63.1	63.5-69.5, incl
Approx wall thickness, mm	2.4	2.4	2.4
Per lb . . Net	1.36	1.66	2.00

C-3825 Glass Tubing—Barometer—In sizes from 5 to 15 mm outside diameter
Per lb. 60

C-3830 Glass Tubing—Capillary Outside diameter, from 5 to 7 mm

No.	A	B	C	D
Diameter of bore, mm	¼	½	¾	1
Per lb	.60	.60	.60	.60

C-3835 Glass Rod—Of best soft glass, easily melted; diameters ranging, as indicated below.

No.	A	B	C	D	E
Diameter, mm	2-3	3	4-5	6-7	8-13
Per lb	.60	.45	.35	.30	.28

C-3840 Glass Stirring Rods—With ends properly rounded

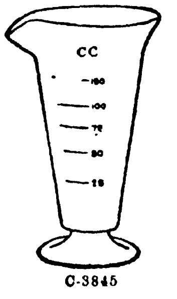
No.	B	C	D	E	F
Length, mm	125	150	200	250	300
Diameter, mm	5	6	6	6	8
Per dozen	.30	.35	.42	.55	.90

C-13445

C-13460 Glass Cutters—Steel wheel; for glass plates.
Each 20

C-13445 Glass Cutter for Tubing — Griffin's —Of brass, nickel-plated, fitted with spring, keeping it open and ready for use.
Each 1.30

Extra Cutting Wheels.
Each 15



C-3845

C-3845 Graduates—Glass—Conical; of ordinary accuracy; graduated in cubic centimeters

No.	D	E	G	I
Capacity, cc	30	60	125	250
Each	.35	.50	.58	.78

No.	J	K	L
Capacity, cc	375	500	1000
Each	1.00	1.20	2.15

C-3850 Graduates — Glass — Conical; graduated in ounces.

No.	E	G	H	I	K	L
Capacity, oz.	2	4	6	8	16	32
Each	.42	.52	.57	.62	1.05	1.80

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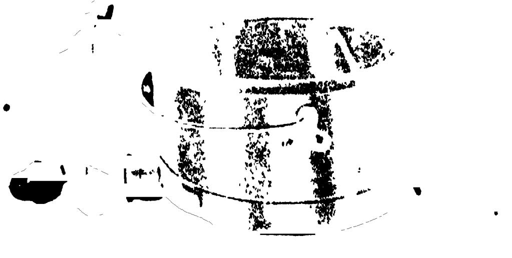
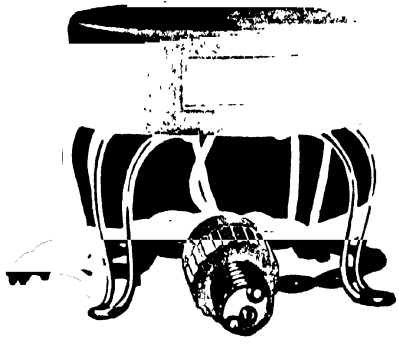


C-13479

C-13479 **Heater—Electric Glue Pot**—A new aluminum heater of jacketed, one piece construction with bail handle that can be used to advantage for many laboratory operations. Heat distribution very uniform and a temp of about 170°F obtained in about 30 minutes. Supplied with heater cord and separable attachment plug

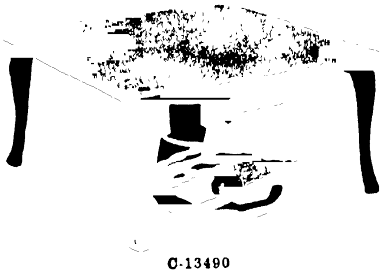
No.	A	B	C	D
Capacity, qts	1	2	4	8
Each	22.00	24.00	28.00	32.00



C-13485

C-13485 **Hot Plate—Electric, Hoskins'**—Circular, of 6-in diameter, has pressed steel top and heavy bent wire legs; spiral resistance unit and uniform heat distribution, draws 500 watts and requires use of 5-ampere snap or knife switch, maximum temperature, 483°C (900°F), boils one liter from cold temperature in 15 minutes, furnished with 6-ft, twin-conductor, flexible cord and detachable connecter plugs
Each ..Net 8.00

C-13486 **Extra Heating Unit.**
Each . Net 4.00
(Please state current and voltage when ordering.)



C-13490

C-13490 **Hot Plate—Electric, Hoskins'**—Square, 12 x 12 in.; has sheet steel top and cast-iron legs; centrally heated by spiral resistance unit, covering circular area of 5¾-in diameter; draws 500 watts and requires 5-ampere snap or knife switch; maximum temperature in center, 260°C (500°F); at edge, 121°C (250°F); boils one liter of water from cold temperature in 15 minutes; furnished with 6-ft, twin-conductor, flexible cord and detachable connector plugs.
Each ..Net 12.00

C-13491 **Extra Heating Unit.**
Each ..Net 4.00
(Please state current and voltage when ordering.)

Prices subject to change without notice

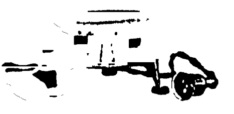
C 13495

C-13495 **Hot Plates—Electric, Hoskins'**—Oblong, with three heats, has steel top and legs, heated by renewable resistance unit, composed of three parallel windings, each controlled by a snap switch on front of plate, gives uniform heat distribution; "low" heat, 246°C (475°F) obtained with switch "1", "medium" heat, 316°C (600°F) with switches "1" and "2", and "high" heat, 399°C (750°F) with switches "1," "2" and "3"; high heat boils one liter of water from cold temperature in 20 minutes, requires use of double-pole knife switch of proper capacity; furnished with 6 ft, twin-conductor, flexible cord and detachable connector plug

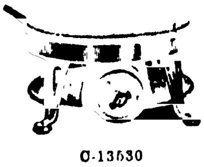
No.		AA	A	B	C
Size, in		12 x 12	12 x 18	18 x 24	18 x 36
Each	Net	40.00	57.50	87.50	110.00

C-13497 **Extra Heating Unit** For sizes A, B and C
Each ..Net 14.50

C-13498 **Extra Heating Unit** For size "AA"
Each ..Net 12.00
(Please state current and voltage when ordering.)



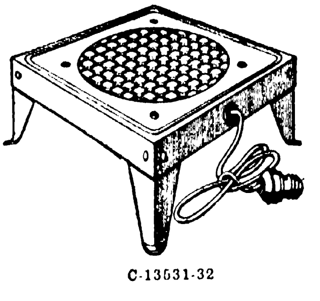
C-13525



C-13530

C-13525 **Hot Plate—Electric**—Of nickel-plated steel; single heat, diameter, 115 mm, height, 75 mm, heating element guaranteed for two years
Each ..Net 7.25
(Please state current and voltage when ordering.)

C-13530 **Hot Plate — Electric** Of nickel-plated steel; equipped with three heat snap switch, heating element guaranteed for two years, diameter, 150 mm; height, 100 mm
Each ..Net 10.00
(Please state current and voltage when ordering.)



C-13531-32

C-13531 **Hot Plate**—An electric stove of durable construction and high efficiency Heating coils below grid permit of rapid boiling One heat, furnished in black japan with cord and plug **for 110 volt A.C. and D.C. only.**
Each ..Net 5.00

C-13532 **Hot Plate**—Same as No. **C-13531** above, but with nickel finish.
Each ..Net 6.00

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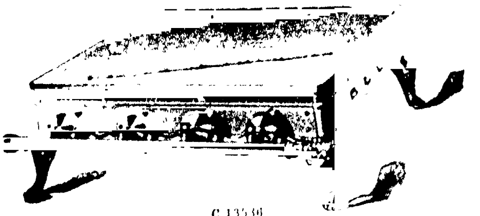
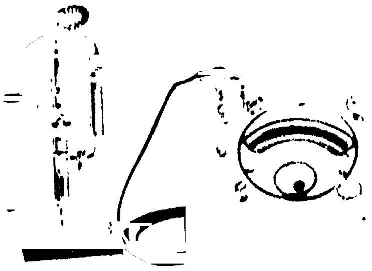


C 13530

C-13530 **Hot Plate Burners** Gas heated, with polished steel top, extra heavy

No	A	B	C	D	E	F
Length, mm	300	460	610	765	915	1220
Width, mm	180	300	400	400	400	400
Each	9 75	19 50	28 00	36.50	44 00	71 50



C 20105

Hydrogen-ion Equipment—Elliott "Ion O-Meter" - This apparatus was developed to fill the pressing need of an equipment that would be simple in operation, of rugged construction, and maintain a high degree of accuracy necessary for the application of the electrometric method to plant and research problems It can be used for the rapid and accurate determination of the concentration of hydrogen and other ions in solutions or industrial liquors without employing the complicated set ups and technique formerly used

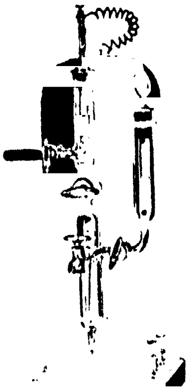
Besides a simplicity which assures its successful use by semi skilled operators the "Ion-O-Meter" is characterized by a rapidity of operation unequaled by any other equipment on the market A complete determination of the strength of a sample of any of the acids ordinarily met with in the laboratory or in the plant may be made within 15 minutes It has been used extensively and with complete success in many biological problems Its portability recommends it for field work in the determination of soil acidities

The "Ion-O Meter" is at present supplied in two models known as the single cell "Ion O-Meter" and the double cell "Ion-O-Meter" The single cell type uses a saturated KCl-calomel electrode as the standard of comparison It is novel in that it has but one contact layer and inasmuch as that junction is between the unknown solution and saturated KCl all so-called contact potential is eliminated

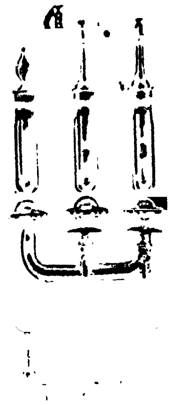
The double cell uses a standard hydrogen electrode for reference which is connected to the unknown cell by a bridge of saturated KCl solution This eliminates all contact potential as well as serving as an excellent conductor of the E M F set up at the electrodes The hydrogen electrodes of both types are made of platinum gauze of very liberal size and coated by our special method with amorphous palladium This process ensures a rapid saturation with the hydrogen gas as well as the ability to stay saturated The saturation is effected by spraying the hydrogen through alundum cones which reduces the size of the bubbles to such an extent that five or ten minutes is ample for complete saturation.

"Ion-O-Meter" Cells are never supplied unmounted The "Ion O-Meter" Pyrovolter was especially designed for use with the instrument On account of its lower resistance it is far preferable to purchase and employ the complete equipment wherever possible However, these cells will function perfectly with any refined type of Potentiometer, and are accordingly listed below both with and without Pyrovolter

C-20105 **Ion-O-Meter, Saturated Calomel Single Contact** Consisting of a single cell mounted on substantial wooden base, fitted with leads, and with binding posts for connecting Pyrovolter, connector for coil to hydrogen tank, sensitized platinum electrode, calomel cell, hydrogen diffusion thimble and Pyrovolter Each . 190 00



C-20110



C-20160

C-20110 **Ion-O-Meter Cells, Single Contact** -Mounted on substantial wooden base with binding posts, single sensitized platinum electrode, fitted with hydrogen diffusion thimbles and connector for coil to hydrogen tank, but without Pyrovolter Each 55.00

C-20115 **Wooden Carrying Case** -For saturated calomel single contact cell Each . 15 00

C-20155 **Ion-O-Meter, Double Contact, Double Hydrogen Electrode** Consisting of a double cell with binding posts for connecting leads from Pyrovolter, connector for coil to hydrogen tank, 2 sensitized platinum electrodes, 2 hydrogen diffusion thimbles, all mounted on substantial wooden base with Pyrovolter Ready for operation Each 205.00

C-20160 **Ion-O-Meter Cells, Double Contact**—Mounted on substantial wooden base, 2 sensitized platinum electrodes, fitted with hydrogen diffusion thimbles and connector for coil to hydrogen tank, but without Pyrovolter Each . .. 70.00

C-20165 **Wooden Carrying Case**—For double contact, double hydrogen cell Each 18.00

Price List Accessories

C-20175 Tipped Double Electric Leads for Pyrovolter, 6 ft long Per set of two 2.00

C-20185 Platinum Electrodes coiled gauze for either single or double cells Each . . 7.50

C-20195 Platinum Electrodes coiled gauze, sensitized, for either single or double cells Each 10 00

C-20205 Platinum Electrodes, charge for re-sensitizing Each 2.50

C-20225 Hydrogen in cylinders of 100 cu ft capacity at 2,000 lb per sq. in pressure, complete with valve and protecting cap Each 40.00

Note – Cylinders must be returned to International Oxygen Co works, as quickly as they become empty, prepaid, before 30 days from date of shipment has elapsed A rental charge of 25c per week will be made against each cylinder that is not returned prepaid to the International Oxygen Co. within one month from date of shipment.

Continued on Next Page

C-20245 Hydrogen in portable cylinders for field tests, 12" long, 4" diam not returnable. Each 10.00

Note Small cylinders if returned to Will Corporation charges prepaid will be re-filled.

Re-filling portable cylinders, each 2.00

C-20275 Pressure Reducing Valve and regulator for delivering hydrogen at low pressure to the Ion-O-Meter, equipped with 2½" U. S. 3000 lb gauge and 2" U. S. 30 lb gauge fitted with left hand thread connection for International Oxygen Company's hydrogen tanks with 2" diaphragm controller. Each . 22.50

C-20295 Heavy walled pure gum rubber tubing for connecting hydrogen tanks with Ion-O-Meter. Per foot . 22

C-20315 Pinchcocks heavy, for Ion-O-Meter hydrogen cells. Each . 30

C-20325 Gas Distributors for connecting up a number of Ion-O-Meter cells with a single hydrogen tank, each lead from distributor individually controlled by pet cocks, for direct connection to pressure regulator 20275. Two-lead distributor. Each . 3.00

C-20350 2-lead distributor with 6 ft copper hydrogen tubes. Each . 7.00

C-20360 4-lead distributor with four 6 ft copper hydrogen tubes. Each 11.00

C-20370 6-lead distributor with six 6 ft copper hydrogen tubes. Each . 15.00

C-20395 Copper hydrogen tubes for connecting multiple gas distributor, 6 ft lengths. Each 2.00

C-20415 Stopcock grease. Per tube 50

Accessory Chemicals

4.1 M KCl solution. Per liter	1.50
4.1 M KCl solution saturated with calomel. Per liter .	2.25
4.1 M KCl solution containing diffusion indicator. Per liter .	1.75
4.1 M KCl solution saturated with calomel containing diffusion indicator. Per liter	2.50
Calomel paste, purified, for use with single contact Ion-O-Meter 4 cc ampoules. Each	50
Purified mercury for single contact Ion-O-Meter, 1 cc ampoules. Each	25
Diffusion indicator, dry. Per 10 gm	95
KCl purified for Hydrogen-ion work, dry. Per 100 g	50
KCl purified for Hydrogen-ion work with diffusion indicator dry. Per 100 g	65
Standard Hydrochloric acid, Ph 0.1. Per liter . . .	1.50

HYDROMETERS

C-3985 Hydrometers—Baumé—For liquids lighter than water, standard quality, about 11 to 12 in long

No.	D	E	F	G	H
Scale	30-10°	40-20°	50-30°	60-40°	70-50°
Divisions	¼	¼°	¼°	¼°	¼°
Each	1.50	1.50	1.50	1.50	1.50

No.	I	J	K	L	M
Scale	80-60°	90-70°	100-80°	50-10°	30-10
Divisions	¼°	¼	¼°	1/10°	1/10°
Each	1.50	1.50	1.50	1.75	1.75

No.	N	O	P	Q	R
Scale .	21-10°	31-19°	41-29°	51-39	61-49°
Divisions	1/10°	1/10°	1/10°	1/10°	1/10°
Each .	1.75	1.75	1.75	1.75	1.75

No.	S	T	U
Scale . .	71-59°	81-69°	91-79
Divisions.	1/10°	1/10°	1/10°
Each .	1.75	1.75	1.75

C-4005 Hydrometers—Baumé—For liquids heavier than water, standard quality, length about 14 in

No.	H	I	J	K	L
Scale .	0-25°	25-50°	50-70°	0-11	5-15°
Divisions	¼°	¼°	¼°	1/10°	1/10°
Each	1.50	1.50	1.50	1.75	1.75

No	M	N	O	P	Q
Scale	9-21	19-31°	29-41	30-50	39-51°
Divisions	1/10	1/10	1/10	1/10°	1/10°
Each	1.75	1.75	1.75	1.75	1.75

No.	R	S	T
Scale	49-61	0-70	59-71
Divisions	1/10	1/10	1/10
Each	1.75	1.75	1.75

C-4182 Hydrometer—Baumé and Specific Gravity Scales—For light liquids, standard quality, length about 12 inches

No	A	B	C
Sp. Gr. scale, degrees	0.700-1.000	0.700-0.850	0.850-1.000
Bé scale, degrees	70-10	70-34	34-10
Each	2.00	2.00	2.00

Sp. Gr. scale, No.	D	E	F
degrees	0.700-0.800	0.800-0.900	0.900-1.000
Bé scale, degrees	70-44	44-25	25-10
Each	2.00	2.00	2.00

C-4172 Hydrometer—Baumé and Specific Gravity Scales—For light liquids, standard quality, length about 6 inches

Sp. Gr. scale, No.	A	B	C
degrees ..	0.700-1.000	0.700-0.800	0.800-0.900
Bé scale, degrees	70-10	70-44	44-25
Each	1.50	1.50	1.50

Sp. Gr. scale, No.	D
degrees	0.900-1.000
Bé scale, degrees ...	25-10
Each	1.50

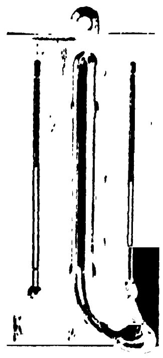
C-4217 Hydrometer—Baumé and Specific Gravity Scales—For heavy liquids, ordinary quality, length about 12 inches

Sp. Gr. scale, No	A	B	C
degrees	1.000-2.000	1.000-1.400	1.400-2.000
Bé. scale, degrees	0-70	0-41	41-70
Each .	1.60	1.60	1.60

Sp. Gr. scale, No	D	E	F
degrees	1.000-1.200	1.200-1.400	1.400-1.600
Bé. scale, degrees	0-24	24-41	41-54
Each	1.60	1.60	1.60

Sp. Gr. scale, No.	G	H
degrees ...	1.600-1.800	1.800-2.000
Bé. scale, degrees	54-64	64-70
Each .	1.60	1.60

C-405



C 407

C-405 Hygrometer—"Hygrodeik," for determining relative and absolute humidity and dew point without reference to table. Black japanned iron frame on base, scale range 20 to 120°F.

Each .. . . .Net 17.50

C-407 Hygrometer—Mason Mounted on oak board 8½ x 4½ in with brass scales range approximately from 20 to 120°F with tables and directions.

Each ....Net 4.00

Prices subject to change without notice

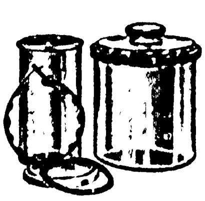
Continued on Next Page

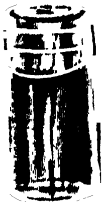
C-4162 Hydrometer Standard quality, same range as No C-4217.

Each	2 00

C-4202 Hydrometer 6 inches long, without thermometer, same ranges as No C-4217

Each	1.50


C 4355 60


C 4365

C-4355 Jars — Preservation Improved form, having perfectly straight sides with no constriction at top, provided with glass cover, fitting absolutely air tight by rubber band and hermetically held in place by metal band, an ideal jar for exhibition purposes

No.	A	B
Capacity, oz	16	32
Height, inside, in	5½	6 7/16
Diameter, inside, in	2½	3 1/8
Each	.40	.47

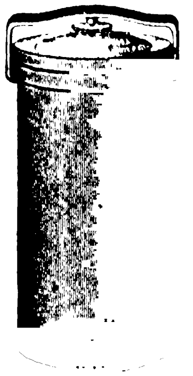
C-4360 Jars—Preservation Same as No C-4355 above, but having cover with knob

No.	A	B	C	D
Capacity, oz	26	52	64	80
Height, inside, in	6	6⅜	7½	8½
Diameter, inside, in	4½	5¼	5½	6
Each	50	.70	85	1.10

C-4365 Jars—Preservation (Lightning) Of greenish glass; lid clamped air-tight by spring clip

No.	A	B	C	D
Capacity, pints	1	1½	2	4
Each	10	12	.13	18
Per dozen	1 10	1 30	1.40	1.90

C-4395

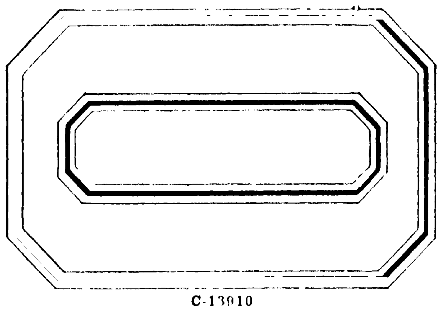

C-4400

C-4395 Jars—Specimen Of clear, white glass, with extra wide mouth and glass stopper carefully ground in

No.	3	5	6	7
Capacity, oz	3½	7	8	12
Height to shoulder, in	2½	5	3½	5
Height to top of stopper, in	4¼	6¾	5½	7
Diameter of body, in	2	2	2½	2½
Diameter of mouth, in	1½	1½	2	2
Each	.50	.63	65	.72
No.	**8**	**10**	**11**	**13**
Capacity, pints	1	1¼	1¾	2½
Height to shoulder, in	7	6	8	8
Height to top of stopper, in	9	8¼	10¼	10½
Diameter of body, in	2½	3	3	3¾
Diameter of mouth, in	2	2½	2½	3
Each	.80	.97	1.15	1.55

C-4400 Jars—Specimen—With mouth same size as body; with rubber band, metallic clamp and two glass suspension rings on under side of glass cover

No.	3	6	7	8	
Capacity, pints	1	1¼	2½	4	
Height without lid, in	8	6	8	12	
Diameter of mouth, in	2¼	3½	3½	3½	
Each	1 55	2 10	2.20	2.60	
No.	**10**	**11**	**17**	**18**	**22**
Capacity, quarts	2¼	4 gal	1½	2¼	7
Height without lid, in	8	12	8	12	36
Diameter of mouth, in	5	5	7⅝	7⅝	7⅝
Each	3 95	4.65	7.80	8.70	15.60


C-13910

C-13910 Labels—Gummed Of superior quality, printed on white paper, with red border

No.	A	B	C	D	E	F
Number	223	217	213	209	205	201
Length, mm	20	25	30	35	45	65
Width, mm	15	20	25	28	35	40
Per 12 boxes Net	1 00	1 00	1.00	1.00	1.00	1 00
Per box Net	.10	10	10	.10	.10	.10
No.	**G**	**H**	**I**	**J**	**K**	**L**
Number	259	261	219	241	239	229
Length, mm	33	50	40	22	30	42
Width, mm	15	15	20	15	18	30
Per 12 boxes Net	1.00	1 00	1 00	1 00	1 00	1 00
Per box Net	10	.10	10	.10	.10	.10

C-13925 Labels—Microscopical—Square, size, 22 mm

Per box of 100	06
Per dozen boxes of 100	.65

C-13955 Label Books—Contain the names and formulas of the most commonly used chemicals and reagents Printed on good paper, gummed and perforated and bound in book form

Per book	.30

C 4440

C-4445

C-4440 Lamps—Alcohol—Of glass, with metal burner and metal cap, shape is such that lamp may be set at various angles, wick included

No.	A	B	C
Capacity, cc	40	120	120
Diameter of burner, mm	5	7	12
Each	.40	.48	.53

C-4445 Lamps—Alcohol—Cylindrical, of clear, white glass; with metal burner and glass cap ground on, wick included

No.	A	B	C
Capacity, cc	60	100	250
Each	.20	.25	.33

Continued on Next Page

C-13960 Measures—Meter Stick—With graduations in Metric system on one side and inches on the other, fitted with metal bound ends

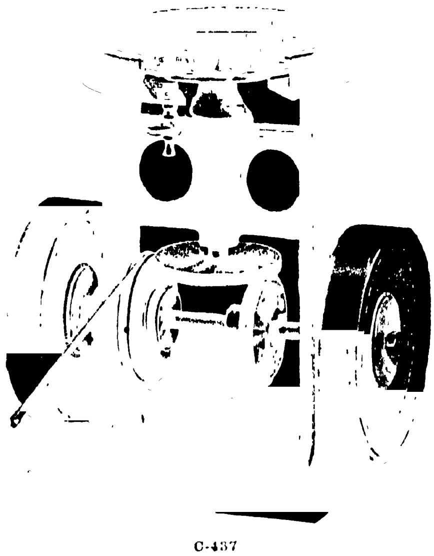
Each	50

C-13961 Measures—Boxwood Scale—With Metric and English graduation 12" long one edge bevelled and accurately graduated in millimeters the other face graduated in inches and 16ths

Each	12
Per dozen	1 25

METALLOGRAPHIC APPARATUS

Metallographic Grinding and Polishing Machine—Wysor Accomplishes all operations from rough grinding to polishing for examination Grinding wheels for roughing medium and finishing are carborundum Polishing discs are of brass with cloth coverings and are easily replaceable on the head of vertical spindle spindles are friction driven from horizontal shaft which can be disengaged when not in use, speed of discs may be varied by shifting friction wheel on shaft Special containers for polishing powders can be supplied



C-437

C-437 Metallographic Grinding and Polishing Machine—Wysor—With three polishing discs, without motor

Each . . . . Net	78 50

C-439 Metallographic Grinding and Polishing Machine—Wysor—Mounted on a cast-iron base with one-eighth horse-power motor

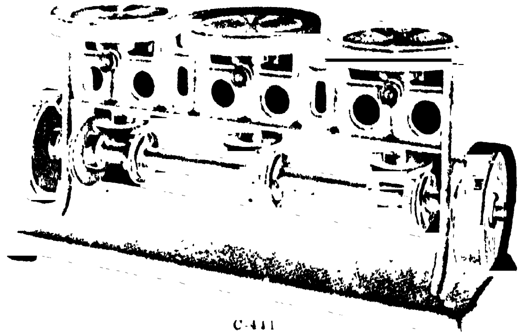
	No. A 110 V-D C	B 220 V-D C
Each . . . . . Net	122.50	125.00
	No. C 110 V-A C	**D** 220 V-A C.
Each . . . Net	122.50	125.00

C-441 Metallographic Grinding and Polishing Machine—Wysor—Large size with three vertical spindles without motor Prices on motors for use with this machine quoted on request

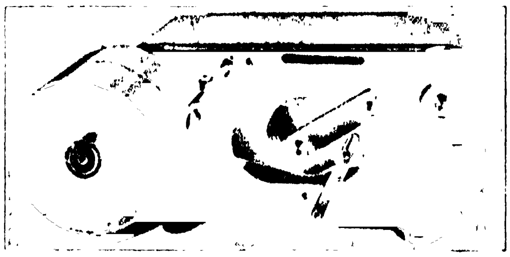
Each . . . . Net	120.00

For illustration see top of page

Metallurgical Microscopes listed on page 1036



C-441



C-445

C-445 Metallographic Grinder Endless belt type for grinding, polishing and finishing of metal, hard rubber and similar specimens Equipped with idler pulley, tight and loose pulley, belt shifter and grinding rest Complete with three grinding belts of varying degree of fineness

Each . . . . Net	55.00

C-446 Vertical Disc Wheel Attachment for above

Each	5.50

C-450

C-450 Brinell Hardness Tester For determination of the degree of hardness of metals by measuring the impression made by the pressure of a hardened steel ball on the smooth surface of the metal Impression can be measured by optical means by vertical magnifier or Brinell microscope, or by mechanical means with depth gauge For 3000 Kg pressure, with control weights but without microscope, magnifier or depth gauge

Each . . . . Net	330.00

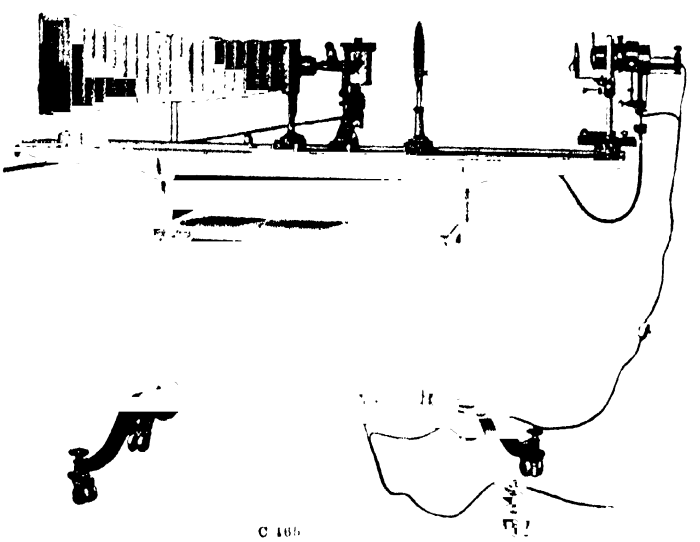
This instrument can be supplied with three different distances between steel ball and screw table of 6½", 12½" and 19".

Prices subject to change without notice

Continued on Next Page

C-453 Depth of Impression Attachment Permits of depth reading to 1/100 mm for use with above Brinell Tester
Each . . . . Net 82 50

C-455 Brinell Microscope A compound microscope with sliding focusing tube carrying a Ramsden eye piece and with a 32 mm achromatic objective fitted with a 7 mm micrometer disc graduated in tenths of a millimeter
Each . . Net 38 50



C 465

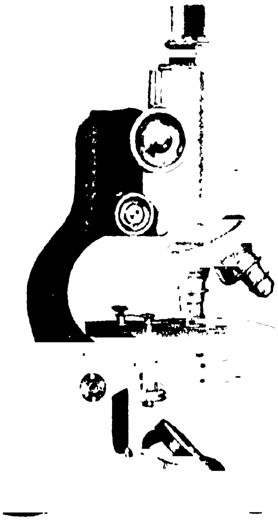
C-465 Microphotographic Outfit—Type GSA-IL9—B. & L. The IL inverted microscope is of heavy rigid construction, horizontal body tube with reflecting mirror and objective carrier supported by substantial pillar, coarse adjustment by rack and pinion operated by worm gear which automatically locks when any downward pressure is put on stage, fine adjustment of standard microscope type which moves stage up or down and may be operated by extension rod and gear, stage 4½" square and capable of supporting large specimens, consists of two plates the upper movable by racks and pinions in two directions at 90 to each other, a special holder with spring clip being supplied for small specimens, body tube provided with adjustable observation tube with sliding inner tube fitted with a 90 prism by which light is reflected to eyepiece of observation tube vertical illuminator and objective mounted on sliding plate on top of reflecting box, vertical illuminator being of special type so arranged that either a clear glass or totally reflecting mirror can be used interchangeably in same mounting The GS type of camera with this equipment is particularly desirable where great rigidity, mechanical accuracy, and use of high magnification are required, supplied with floor stand or with special short flat supports for laboratory table or embedding in a cement foundation if so specified, illuminating system consists of 5 amp, 90° hand feed arc lamp with rheostat for 110 volts or a 6 volt mazda lamp and transformer for 110 volts, a close up spheric condenser 60 mm in diameter in focusing mount, removable iris diaphragm, support for ray filter, filters, adjustable for height on two rods with screws for vertical and lateral adjustment, supplementary condenser 36 mm in diameter with iris diaphragm and light shield on adjustable support works in conjunction with aspheric condenser and vertical illuminator Outfit as described with one each 32, 16 and 4 mm achromatic objectives (corrected for uncovered objects and short-mounted) and one pair each of 6.4x and 10x eyepieces
Price 715.00

Prices subject to change without notice

C-467 Microphotographic Outfit—GSM-IL9—Same as above but with six volt mazda lamp and transformer in place of arc lamp
Price . . . 705 00

The above is representative of a complete line of photomicrographic apparatus that we carry. Illustrated booklet on request

MICROSCOPES AND MAGNIFIERS



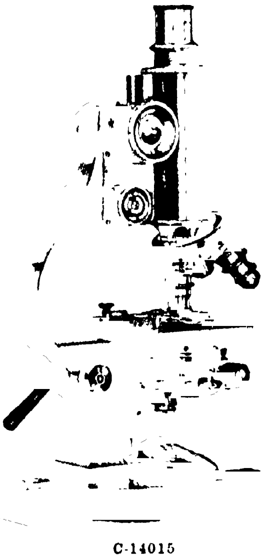
C-13985

C-13985 Microscope FFS—B. & L.—Coarse adjustment by standard rack and pinion, provided with stop to prevent pinion from over-riding rack, side fine adjustment is of lever type with micrometer head on both sides of arm; stage completely covered with metal except at point of attachment and measures 102 x 102 mm; substage adjustable for focus by quick acting screws Furnished in hard wood case with optical equipment as listed below

Objectives			Eyepieces	Nosepiece
Dry		Oil Immersion	5x 10x	
16 mm	4 mm	1.9 mm		Circular Triple

Abbe Condenser
1.20 N.A.

Each 132.00



C-14015

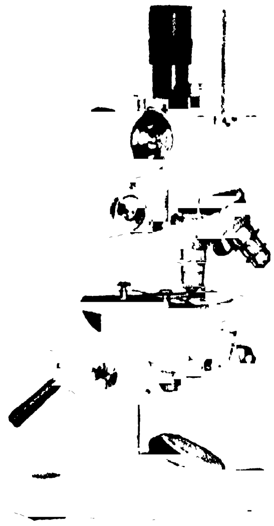
Continued on Next Page

C-14015 Microscope CAS Large model with 39 mm body tube and pillar of rectangular cross section with double bearing inclination joint and clamping lever, fine adjustment heads graduated to read 2.5 microns of vertical movement Stage 116 x 108 mm with a distance of 87 mm from center to arm at stage surface, substage furnished with swing out condenser which may be swung down so as to facilitate the use of illumination by mirror alone, injury to diaphragm being prevented by a locking device furnished in hard wood case with optical equipment as listed below

Objectives			Eyepieces	Nosepiece
Dry		Oil Immersion		
16 mm	4 mm	1.9 mm	5x 10x	Circular Triple

Abbe Condenser
1.20 N A

Each 192.00



C 14070

C-14070 Microscope CAE—Binocular, B. & L.—This binocular microscope of parallel tube and mono objective type uses all regular optics of all powers including oil immersion objective Body tube has special prism system fitted with two parallel eyepiece tubes, separation of which is varied by the mill head between and the interpupillary distance indicated on the millimeter scale Side fine adjustment, stage 116 x 108 mm is of metal, completely covered with vulcanized rubber except at point of attachment Substage furnished with swing-out condenser Furnished in hard wood case with optical equipment as listed below

Objectives Achromatic			Paired Eyepieces	Nosepiece
Dry		Oil Immersion	Huygenian	
16 mm	4 mm	1.9 mm	5x 10x	Circular Triple

Abbé Condenser
1.20 N A

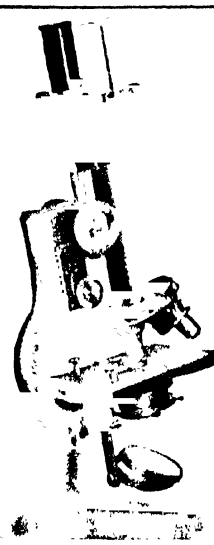
Each 270.00

C-14072 Microscopes CAE—Binocular B. & L.—Same as No C-14070, but without oil immersion objective and with circular double nosepiece
Each 225.50

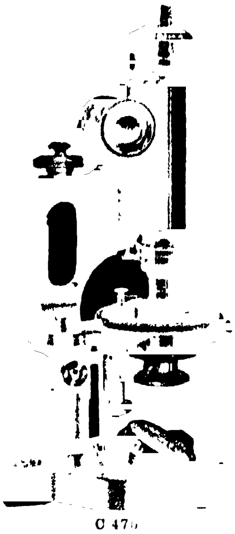
C-14088 Stereoscopic Eyepiece—B. & L. A newly designed eyepiece making possible the rapid conversion of any monocular microscope into a binocular and thus obtaining a very pronounced stereoscopic effect and an observation of detail that might easily escape the eye when using a monocular model There is a complete absence of eye fatigue even when working steadily for hours, interpupillary distance being adjustable, because of increased tube length objectives give nearly double their ordinary magnifications, stereoscopic effect is further enhanced by a set of eyepiece cap diaphragms with semi circular openings, these being adjustable for the eyepoint of the eyepiece Threaded collar ordinarily supplied will fit the B & L Models F, FF, FFS, FCS, or FDS, and special adapters can be supplied for other types or old models Finished in alcohol proof crystal black with two 6.4x matched eyepieces, eyepiece cap diaphragms and case

Each 50.00

Adapters for other models and threaded collars for other makes can be supplied Prices upon request Special circular upon application



C 14088



C 475

C-475 Microscope—Chemical—B & L Designed by Professor E Chamot for microchemical analysis, with circular revolving stage graduated on the circumference with single degrees Arm of handle type, 34 mm diameter body tube with coarse adjustment by standard rack and pinion with stop to prevent pinion from overriding rack, fine adjustment of lever type with two sized knurled head for slow and rapid movement, ceasing to operate when objective touches slide Substage adjustable for focus by quick acting screw consists of mounting for polariser which is swung to left of optical axis when screw reaches limit of motion downward, analyzer consists of Thompson prism mounted in revolving collar

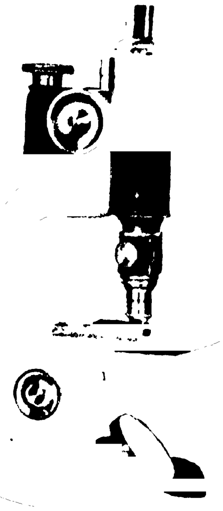
Continued on Next Page

graduated in two degree division and can be immediately removed for insertion of microscope eyepiece Entire instrument finished in durable black, in hardwood case with following optical equipment, 16 mm, 8 mm, Achromatic Objectives, 10x, 12 5x Cross hair Eyepieces
Each 140 00

C-478 **Microscope—Chemical—B & L** Same as above but with two quick changing nosepiece rings
Each . 151 00

C 480 **Microscope—Chemical—B & L** Same as No **C-475** above but with 32 mm, 16 mm and 8 mm achromatic objectives, 5x, 7 5x 10x and 12 5x, Cross hair Eyepieces and with three quick changing nosepiece rings
Each 174 50

C-483 **Auxiliary Stage,** fitting substage of above microscopes for use in metallurgical work
Each 6 25



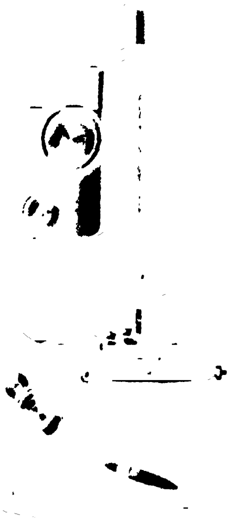
C-487

C-487 **Microscope—Metallurgical—FM—B. & L**—After design by Dr Albert Sauveur Stage adjustable vertically by standard rack and pinion to increase working distance and allow focusing without displacing vertical illuminator with reference to light source, vertical illuminator of plain glass reflector type readily adjustable Coarse adjustment by standard rack and pinion with top fine adjustment in hardwood case with 16 and 4 mm objectives and 7 5x eyepiece
Each 120 00

C-489 **Microscope—Metallurgical—FM—B. & L.**—Same as above, but with 16 and 4 mm objectives and 5x and 10x eyepieces
Each 122.50

Objectives in above outfits are in regular size mounts, 4 mm objectives being specially corrected for uncovered objects If objectives with short mounts are desired add $3 50 for each objective

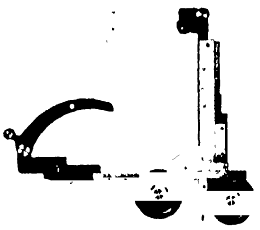
C-494 **Microscope—Metallurgical—FSM—B. & L.**—Of Sauveur design and unexcelled for high grade work Of similar construction to No **C-487** above, but with side fine adjustment and pillar provided with broad double bearing inclination joint having vertical and horizontal stop, body tube 39 mm and vertical illuminator of plain glass reflector type provided with threaded aperture to receive condenser tube when this is ordered Circular stage adjusted vertically by standard rack and pinion 78 mm in diameter with 40 mm aperture of metal with vulcanite top provided with centering screws and spring clips removable for substitution of mechanical stage In hard wood case with 16 and 4 mm achromatic objectives and 5x eyepiece.
Each 198.00



C 494

C-496 **Microscope—Metallurgical—FSM—B. & L.**—Same as above, but with 16 mm and 4 mm. objectives and 5x and 10x eyepieces
Each 200 50

C-498 **Microscope—Metallurgical—FSM—B. & L.**—Same as No **C-494** above, but with 32 mm, 16 mm and 4 mm objectives and 5x and 10x eyepieces
Each 207.00



C-14135

C-14135 **Mechanical Stage—Bausch & Lomb** For use on microscopes with square-cornered stages, clamp is adjustable, front portion having top plate for instant leveling of stage, adjustment is by rack and pinion, giving equal speeds in both movements, slide-holder is provided with adjustable stops, main parts neatly finished in black lacquer to prevent reflections, scales are engraved on fine German silver.
Each 27.50

C-14137 **Mechanical Stage—B. & L.**—This stage is for use on metallurgical microscope FSM. Adjustments are similar to those of No **C-14135,** but are mounted on stage plate so as to be interchangeable with the plain revolving stage regularly supplied with microscope FSM
Each 42.00

C-14155 **Micrometers, Stage—B. & L.**—Consist of slides measuring 75 x 25 mm upon which the scales are mounted, the ruling being of a high degree of accuracy, in case

No.	A	B	C
Material	Glass	Glass	Metal
Ruled to	0 1 to 0 01 mm.	0 01 to 0.001 mm.	0 1 to 0 01 mm
Each	5.00	3.50	14.50

Prices subject to change without notice

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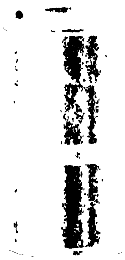
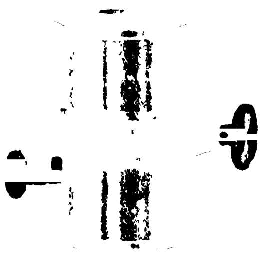


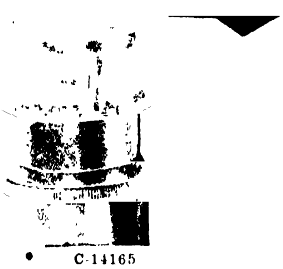
C-14150A



C 14150B

C-14150 Micrometer Eyepieces—B. & L - Furnished in two forms, one with fixed and the other with moveable scale Scale is divided into tenths of a millimeter with every fifth and tenth line longer than the others and every tenth line numbered

No.	A	B
Magnification	7 5x	7 5x
Scale	Fixed	Movable
Each	8 00	13 25



C-14165

C-14165 Camera Lucida—Abbé, B. & L. Clamp equipped with clamping screw conveniently placed so that it can be easily raised or lowered on eyepiece tube, prism is of Abbé type, mounted on closed case, fixed in optical alignment, mirror is in fixed position close to prism, set at an angle of 30° from the horizontal

Each . . 14.50

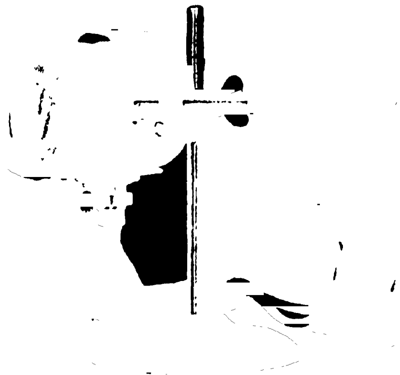
Two recent modifications of the Camera Lucida can be supplied, prices and descriptive matter upon application

C-14106 Lens Paper - Of finest quality for cleaning and polishing lenses In books of fifty sheets, 8½ x 12½ cm

Each . ... .12

C-14107 Lens Paper Same quality as No C-14106, but in packages of 100 sheets

No.	A	B
Size, in	18 x 12	9 x 12
Each	1 20	.60



C-14270

C-14270 Microscope Lamp, Adjustable—Bausch & Lomb— This contains a 6-volt, 24-watt, gas-filled mazda, a new development in illumination, the filament is so concentrated that the light approximates the ideal point-source; lamp socket is carried in a sliding plate which runs the length of the housing and permits the lamp to be adjusted with reference to the condenser, condensers are of two types, either the ordinary bi convex or our aspheric type, current can be drawn from any lamp socket, using a transformer on alternating current and a rheostat on direct current, furnished with regular spherical condensing lens and transformer for 110 volt, AC circuit

Each 23 50

6-volt, 24-watt, gas-filled mazda Lamp—For use with above lamp, bulb only

Each . .. .Net 1 25

C-14275 Microscope Lamp—Adjustable, Bausch & Lomb - Same as No C-14270 above, but with Aspheric Condenser, which is corrected for spherical aberration

Each 35 50

C 14280 Microscope Lamp, Adjustable—Bausch & Lomb Same as No C-14270, but with rheostat for 110 volts DC or AC circuits in place of transformer

Each 24.50

C 14285 Microscope Lamp—Adjustable, Bausch & Lomb Same as No C-14280 above, but with Aspheric Condenser, which is corrected for spherical aberration

Each 36 50

C-14325

C-14325 Microscope Illuminator—Silverman's Can be used in practically every field of microscopy, consists of a circular source of light surrounding the objective and furnishing a diffused and uniform illumination at the spot to be examined, absorption disk is of blackened brass, furnished with tungsten lamp, flexible cord with attachment plug for connecting electric light socket with rheostat, stage adapter and rheostat for 104 to 124 volts

Each .... .Net 45 00

C-14330 Microscope Illuminator—Silverman's Same as No C-14325 above, but with rheostat for 208 to 248 volts

Each ....Net 46.00

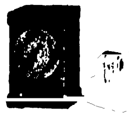
Extra Lamps. Colorless glass.

Each .. ..Net 4.00

Extra Lamps. "Daylight" (blue) glass

Each . ...Net 4.50

(Please state voltage and current when ordering.)



C-14335

C-14335 Microscope Substage Lamp—Bausch & Lomb—Is of unusual compactness and efficiency, complete outfit is placed under the microscope stage, the mirror being turned aside so that lamp sends its rays directly to the specimen, illuminant is small 15-watt mazda lamp, 110-115 volts, direct or altering current, connecting with any

Continued on Next Page

lamp socket, housing of metal, has double, ventilated sides and top deep curve reflector used behind lamp bulb intensifies the illumination, furnished with five and one half feet of silk wound cord with plug one blue glass and one ground glass
Each 6 00

Resistance Unit For use with 15 watt, 110 volt lamp on 220 volt circuit
Each 4 25

15 watt Lamp Bulb only for use with above Lamp
Each . . Net 1 00

C 14338 **Microscope Substage Lamp—Bausch & Lomb** Same as No C-14335 above but with Corning "Day-lite" glass in place of blue and ground glasses
Each 7 00

C 14355 **Microscopic Cover Glasses** Of superior quality, true to size, uniform in color and smoothly cut, No 1 thickness varies from 0 13 to 0 17 mm, No 2 from 0 17 to 0 25 mm, No 3 from 0 25 to 0 50 mm, square 100 in a box or in half ounce packages

No.	A	B	C	D	E
Size in mm	18	18	18	22	22
Thickness	No 1	No 2	No 3	No 1	No 2
Per oz	1 25	1 10	1 00	1 25	1 10

No	F	G	H	I
Size, in mm	22	25	25	25
Thickness	No 3	No 1	No 2	No 3
Per oz	1 00	1 25	1 10	1 00

C 14360 **Microscopic Cover Glasses—Round** Same sizes and prices as No C-14335 above

C-14375 **Microscopic Object Slides** Made of domestic crown glass, free from defects, of uniform thickness and color, with edges ground, object slides of selected measured thickness will be furnished at prices double those listed

No.	A	C	E
Size, in mm.	25 x 75	25 x 75	50 x 75
Thickness	Medium	Extra Thin	Medium
Color	Half White	Half White	Half White
Per gross	1 85	1 90	2 50

C-14380

C-14380 **Object Slides** For culture work and hanging drop preparations, with concave depression, ground in slide and polished, regularly supplied in packages of ten, size 25 x 75 mm, medium thickness
Per ten 75

C-14405 **Microscopic Slide Boxes**—Substantially made of light wood; supplied with index and label for recording titles, covers fit tight inside the edges

No.	A	B
Capacity	12	25
Size of slides, in mm	25 x 75	25 x 44
Per 10	1 25	2 00

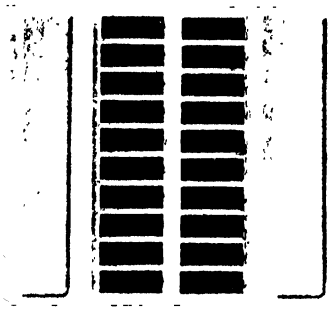
C 14410

C-14410 **Microscopic Slide Boxes** Same as No C-14405 above, but with covers that fit over the top, so that when they are removed the slides, projecting above the box edges, can be easily removed

No.	A	B
Capacity	25	25
Size of slides, in mm	50 x 75	25 x 75
Per 10	3.25	1.75

C-14415

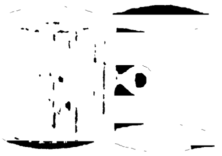
C-14415 **Microscopic Slide Boxes** A very compact and convenient slide box, made of wood and heavy cardboard, suitably covered, provided with numbered slide index, and register for recording data of interest, cover is hinged and fitted with catches, and when raised exposes slides so that they can be removed easily, box is divided into two rows, with a capacity for 100 slides, size of slides, 25 x 75 mm
Each 90



C-14427

C-14427 **Slide Trays—Map Form**—Of double weight, heavy cardboard, the inserts for the slides having a white background and an impression to facilitate the removal of the individual slides To contain fourteen slides in two rows
Each 40

C-14429 **Slide Trays—Map Form**—Same as above, but to hold twenty slides
Each 45



C-420

C-422

C-420 **Magnifiers—Coddington**—In metal mounting, folding, very powerful

No.	A	B	C	D
Magnification	7x	10x	14x	20x
Equivalent focus, mm	38	25	19	13
Each	3.25	3.25	3.25	3.25

C-422 **Magnifiers — Triple Aplanates** — Composed of two meniscus lenses of flint glass separated by a double convex lense of crown glass. Field is large and flat and correction for aberration is perfect

No.	A	B	C	D
Magnification	7.5x	10x	15x	20x
Equivalent focus, mm	34	25	17	13
Each	6.50	6.50	6.50	6.50

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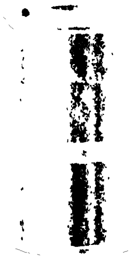
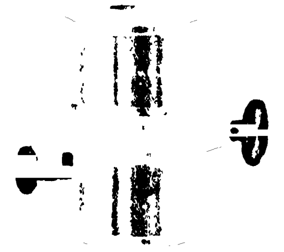


C-14150A



C 14150B

C-14150 Micrometer Eyepieces—B. & L - Furnished in two forms, one with fixed and the other with moveable scale Scale is divided into tenths of a millimeter with every fifth and tenth line longer than the others and every tenth line numbered

No.	A	B
Magnification	7 5x	7 5x
Scale	Fixed	Movable
Each	8 00	13 25

C-14165

C-14165 Camera Lucida-- Abbé, B. & L. Clamp equipped with clamping screw conveniently placed so that it can be easily raised or lowered on eyepiece tube, prism is of Abbé type, mounted on closed case, fixed in optical alignment, mirror is in fixed position close to prism, set at an angle of 30° from the horizontal

Each . . 14.50

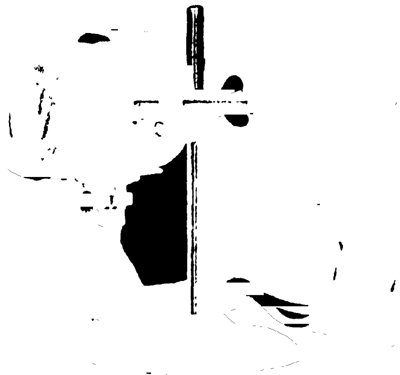
Two recent modifications of the Camera Lucida can be supplied, prices and descriptive matter upon application

C-14106 Lens Paper - Of finest quality for cleaning and polishing lenses In books of fifty sheets, 8½ x 12½ cm

Each . ... .12

C-14107 Lens Paper Same quality as No C-14106, but in packages of 100 sheets

No.	A	B
Size, in	18 x 12	9 x 12
Each	1 20	.60



C-14270

C-14270 Microscope Lamp, Adjustable—Bausch & Lomb— This contains a 6-volt, 24-watt, gas-filled mazda, a new development in illumination, the filament is so concentrated that the light approximates the ideal point-source; lamp socket is carried in a sliding plate which runs the length of the housing and permits the lamp to be adjusted with reference to the condenser, condensers are of two types, either the ordinary bi convex or our aspheric type, current can be drawn from any lamp socket, using a transformer on alternating current and a rheostat on direct current, furnished with regular spherical condensing lens and transformer for 110 volt, AC circuit

Each 23 50

6-volt, 24-watt, gas-filled mazda Lamp—For use with above lamp, bulb only

Each . . . .Net 1 25

C-14275 Microscope Lamp—Adjustable, Bausch & Lomb - Same as No C-14270 above, but with Aspheric Condenser, which is corrected for spherical aberration

Each 35 50

C 14280 Microscope Lamp, Adjustable—Bausch & Lomb Same as No C-14270, but with rheostat for 110 volts DC or AC circuits in place of transformer

Each 24.50

C 14285 Microscope Lamp—Adjustable, Bausch & Lomb Same as No C-14280 above, but with Aspheric Condenser, which is corrected for spherical aberration

Each 36 50

C-14325

C-14325 Microscope Illuminator—Silverman's Can be used in practically every field of microscopy, consists of a circular source of light surrounding the objective and furnishing a diffused and uniform illumination at the spot to be examined, absorption disk is of blackened brass, furnished with tungsten lamp, flexible cord with attachment plug for connecting electric light socket with rheostat, stage adapter and rheostat for 104 to 124 volts

Each .... .Net 45 00

C-14330 Microscope Illuminator—Silverman's Same as No C-14325 above, but with rheostat for 208 to 248 volts

Each ....Net 46.00

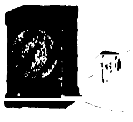
Extra Lamps. Colorless glass.

Each .. ..Net 4.00

Extra Lamps. "Daylight" (blue) glass

Each . ...Net 4.50

(Please state voltage and current when ordering.)



C-14335

C-14335 Microscope Substage Lamp—Bausch & Lomb--Is of unusual compactness and efficiency, complete outfit is placed under the microscope stage, the mirror being turned aside so that lamp sends its rays directly to the specimen, illuminant is small 15-watt mazda lamp, 110-115 volts, direct or altering current, connecting with any

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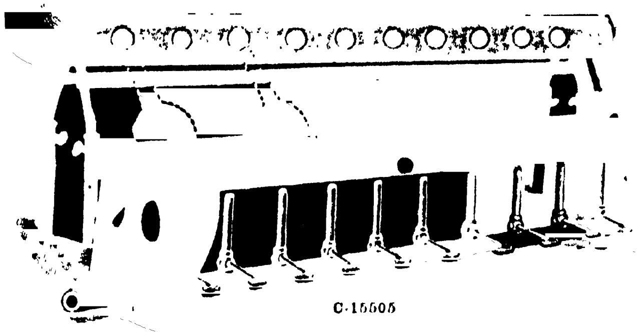
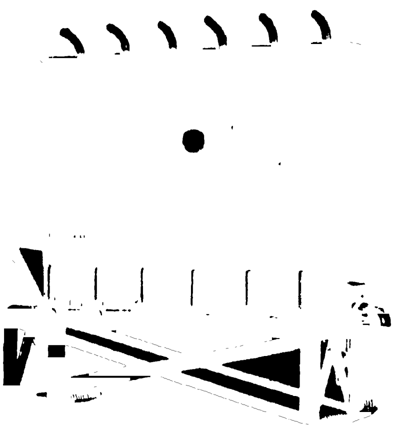
NITROGEN DETERMINATION APPARATUS



C-15505

C-15505 Digestion Shelf — Johnson's — Used extensively in Agricultural Experiment Stations, necks of flasks rest in holes in lead pipe which conveys fumes to chimney, has shelf, complete without glassware

	No. A	B	C
No of flasks	6	10	13
Length, in	29	46	60
Each	Net 60.00	82.50	97.50



C-15537

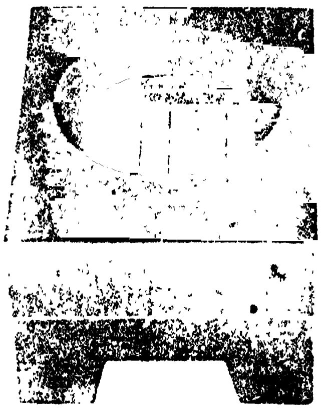
C-15537 Distilling Apparatus—Kjeldahl's—On stand; consists of polished heavy copper condenser tinned inside, with block tin condensing coils, with iron shelf and six adjustable burners. An ideal equipment for water, food and fertilizer work.
Each ....Net 97.50

C-15538 Distilling Apparatus — Kjeldahl's — Of convenient form to be hung on wall. Same as No. C-15537 above, but without table stand
Each ....Net 90.00

C-15525 Hot Plate, Electric—Gilmer's—Designed particularly for Kjeldahl determinations, but is not limited to this kind of work. The parts are few, simple and replaceable without the delay usually incurred in special apparatus. There are four principal parts and ten such as nuts, bolts, terminals, etc. Constructed of hydraulic pressed asbestos and accommodates any of the ordinary laboratory vessels. Particularly adapted to agricultural chemical laboratories, where their use is indispensable. Manufactured in voltages of 55, 73⅓ and 110 volts, each stove consumes about 400 watts. Heating capacity is such that a regular 800 cc flask containing 450 cc. of water will be boiled and 250 cc. distilled over inside of 60 minutes. Complete.
Each 8.50

Replacement parts:

No. A. Base Plates. Each	3.20
No. B. Cover Plates. Each	2.70

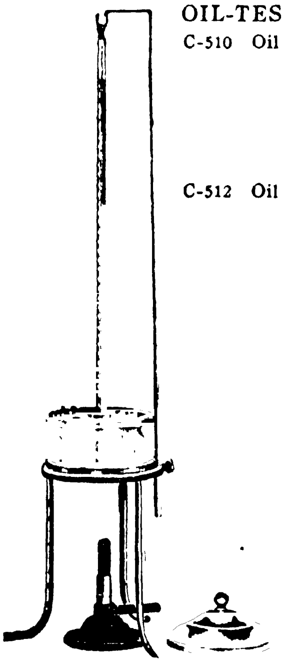


C-15525

No. C. Heating Units Each	2.55
No. D. Rewinding of Heating Units Each	2.10
No. E. Heating Unit Plate Each	1.00
No. F. Coiled Wire. Each	1.70
No. G. Fahenstock Connector, single Per dozen	.60
No. H. Terminals, complete Per dozen	1.30

(Please state voltage and current when ordering.)

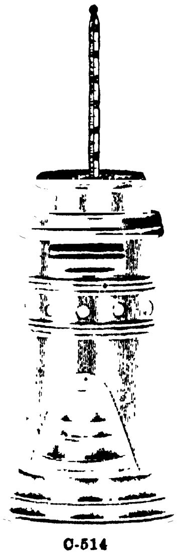
OIL-TESTING APPARATUS



C-512

C-510 Oil Tester—Cleveland Open-Cup—For determination of the flash-point of lubricating or heavy oils, of heavy brass construction, without thermometer, with Bunsen burner
Each 12.75

C-512 Oil Tester—Cleveland Open-Cup—Similar to the above but with accurate thermometer reading to about 600°F. and Bunsen burner for gas
Each 15.00



C-514

C-514 Oil Tester—Elliott—For flash-points of illuminating oil only, adopted as standard by the states of New York, New Jersey, Iowa and Michigan. With standard thermometer and oil lamp.
Each ....Net 15.60

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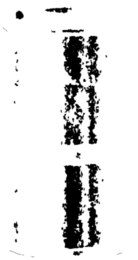
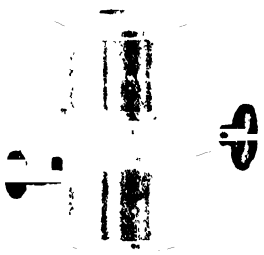

C-14150A


C 14150B

C-14150 **Micrometer Eyepieces—B. & L** - Furnished in two forms, one with fixed and the other with moveable scale Scale is divided into tenths of a millimeter with every fifth and tenth line longer than the others and every tenth line numbered

	No. A	B
Magnification	7 5x	7 5x
Scale	Fixed	Movable
Each	8 00	13 25

C-14165

C-14165 **Camera Lucida—Abbé, B. & L.** Clamp equipped with clamping screw conveniently placed so that it can be easily raised or lowered on eyepiece tube, prism is of Abbé type, mounted on closed case, fixed in optical alignment, mirror is in fixed position close to prism, set at an angle of 30° from the horizontal

Each . . 14.50

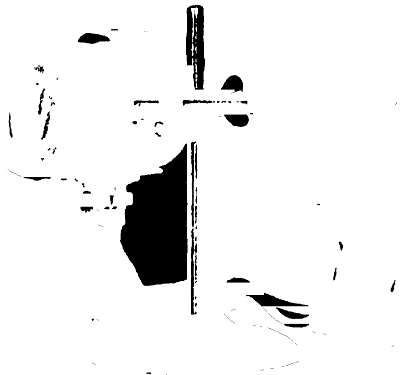
Two recent modifications of the Camera Lucida can be supplied, prices and descriptive matter upon application

C-14106 **Lens Paper** - Of finest quality for cleaning and polishing lenses In books of fifty sheets, 8½ x 12½ cm

Each . ... .12

C-14107 **Lens Paper** Same quality as No C-14106, but in packages of 100 sheets

	No. A	B
Size, in	18 x 12	9 x 12
Each	1 20	.60


C-14270

C-14270 **Microscope Lamp, Adjustable—Bausch & Lomb**— This contains a 6-volt, 24-watt, gas-filled mazda, a new development in illumination, the filament is so concentrated that the light approximates the ideal point-source; lamp socket is carried in a sliding plate which runs the length of the housing and permits the lamp to be adjusted with reference to the condenser, condensers are of two types, either the ordinary bi convex or our aspheric type, current can be drawn from any lamp socket, using a transformer on alternating current and a rheostat on direct current, furnished with regular spherical condensing lens and transformer for 110 volt, AC circuit

Each 23 50

6-volt, 24-watt, gas-filled mazda Lamp—For use with above lamp, bulb only

Each . . . .Net 1 25

C-14275 **Microscope Lamp—Adjustable, Bausch & Lomb** - Same as No C-14270 above, but with Aspheric Condenser, which is corrected for spherical aberration

Each 35 50

C 14280 **Microscope Lamp, Adjustable—Bausch & Lomb** Same as No C-14270, but with rheostat for 110 volts DC or AC circuits in place of transformer

Each 24.50

C 14285 **Microscope Lamp—Adjustable, Bausch & Lomb** Same as No C-14280 above, but with Aspheric Condenser, which is corrected for spherical aberration

Each 36 50

C-14325

C-14325 **Microscope Illuminator—Silverman's** Can be used in practically every field of microscopy, consists of a circular source of light surrounding the objective and furnishing a diffused and uniform illumination at the spot to be examined, absorption disk is of blackened brass, furnished with tungsten lamp, flexible cord with attachment plug for connecting electric light socket with rheostat, stage adapter and rheostat for 104 to 124 volts

Each .... .Net 45 00

C-14330 **Microscope Illuminator—Silverman's** Same as No C-14325 above, but with rheostat for 208 to 248 volts

Each ....Net 46.00

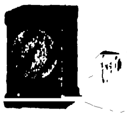
Extra Lamps. Colorless glass.

Each .. ..Net 4.00

Extra Lamps. "Daylight" (blue) glass

Each . ...Net 4.50

(Please state voltage and current when ordering.)


C-14335

C-14335 **Microscope Substage Lamp—Bausch & Lomb**—Is of unusual compactness and efficiency, complete outfit is placed under the microscope stage, the mirror being turned aside so that lamp sends its rays directly to the specimen, illuminant is small 15-watt mazda lamp, 110-115 volts, direct or altering current, connecting with any

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and similar oils at 210 F., reduce black oils at 130 F. and neutral, spindle, paraffin, red, and other distilled oils at temperatures from 70 to 212°F. Complete with flask and six thermometers without stop watch

Each . . . . Net 90.00

C-547 **Viscosimeter—Saybolt Universal Standard**—Same as above but with stop watch

Each . . . . Net 100.00

C-549 **Stop-watch** only

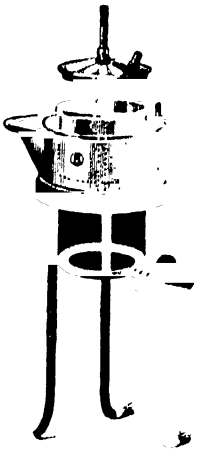
Each . . . . Net 12.00

C-550 **Extra flasks,** graduated, 60 cc.

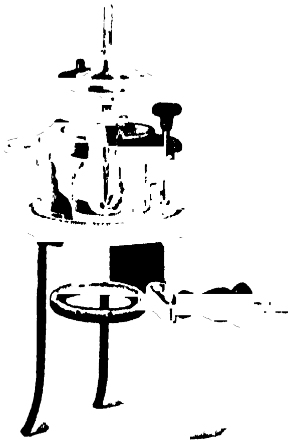
Each . . . . Net 2.50

C-552 **Extra Thermometers** for use with the above

Each . . . . Net 3.60



C 555



C-558

C-555 **Viscosimeter—Engler's** Latest form for light or heavy wall with oil container, gold-plated and platinum tube, ring burner and tripod, but without flask or thermometer.

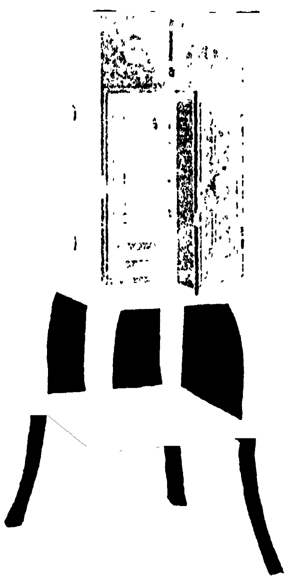
Each . . . . Net 67.50

C-558 **Viscosimeter—Engler's, as modified by Ubbelohde**—For light and heavy oils with oil container, gold-plated and platinum outlet tube, with air space in lid, stirring arrangement in bath to keep temperature constant, tripod and ring burner with handle, but without thermometer or flask.

Each . . . . Net 90.00

OVENS

Ovens—Freas' Electric—Approved by the National Board of Fire Underwriters, have become favorably known for their durable construction, reliability and accuracy, and are satisfactory for long, continuous and unattended operation; are always ready for use, and are easily and quickly regulated for any desired temperature; constructed with a double wall of heavy asbestos transite, which is absolutely fireproof, with cast aluminum frame and door; air space between inner and outer asbestos walls is filled with air-cell asbestos, permitting very little loss of heat and reducing current consumption to a minimum; interior of each is fitted with shelf racks, allowing shelves to be placed at any desired height; a small electric lamp within the oven, which can be lighted at will, is used for illumination and as a pilot, small window in door permits contents to be observed without opening door; two openings on each side of oven, which can be closed if desired, give ventilation; Freas' regulator, made entirely of metal and of durable construction, so constructed that no vapor from evaporating residues can reach contact points, regulates the temperature to within a fraction of a degree; temperature range is from that of the room to 180°C and in high temperature oven, to 260°C.; heating element, wound for 600 watts and requiring 250 watts to maintain a temperature of 105°C., consists of wire wound resistance plate on bottom of oven

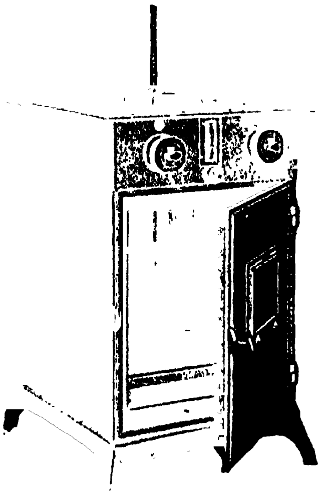


C-16000-B

C-16000 **Ovens—Freas' Electric. (Type R)**—On heavy iron base, with legs, intended for temperature to 180°C., furnished with flexible cord and plug to fit socket of ordinary lighting circuit and with high grade thermometer of special design, with graduating etched to 200°C.

No.	A	B	C	D
Height, in	16	18	20	22
Width, in	16	14	26	32
Depth, in	14	17	14	18
Each . . . Net	245.00	265.00	330.00	400.00

(Please state voltage and current when ordering.)



C-16005

C-16005 **Oven—Freas' Electric**—Same as above, but with cast-iron base to stand on table; height, 12 in.; width, 12 in., depth, 12 in. inside.

Each . . . . Net 135.00

(Please state voltage and current when ordering.)

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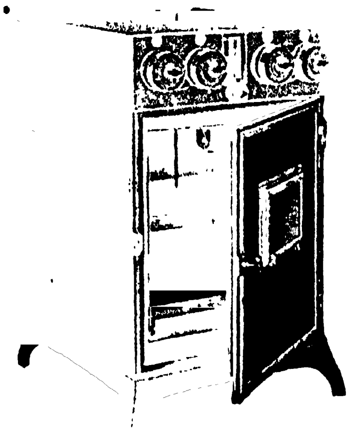


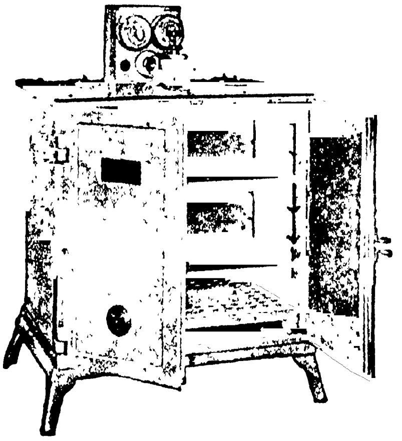
C-16015

C-16010 Oven—Freas' Electric—For High Temperatures—Mounted on heavy iron base with legs, provided with two "heat" switches, one of which can be turned off when desired temperature has been reached, furnished with flexible cord and plug to fit socket of ordinary lighting circuit and with high grade thermometer of special design, with graduation etched to 300°C; inside dimensions, height, 18 in; width, 14 in; depth, 17 in
Each ....Net 285.00

(Please state voltage and current when ordering.)

C-16015 Oven—Freas' Electric—Same as above, but with cast iron base to stand on table, inside dimensions, height, 12 in, width, 12 in, depth, 12 in
Each .... .Net 165.00

(Please state voltage and current when ordering.)



C-16065

C-16065 Oven—Thelco Electric—Substantially constructed of asbestos wood with cast aluminum frame, door frame and adjustable racks for the perforated aluminum shelves; suitable for routine laboratory work or students' use because of ease of setting and accurate maintenance of temperature, which is kept from within 1° of room heat to 160°C by the bimetallic regulator, contacts are outside the chamber; pilot lamp indicates when circuit is opened or closed; has openings in top of oven for ventilation and thermometer, and adjustable ventilators in top and door; heating plate is removable; supplied with cord and plug ready to connect with light socket

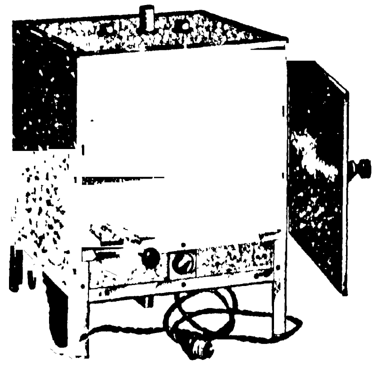
No.	A	B
Height, cm	36	31
Width, cm	31	25
Depth, cm	46	25
Each	Net 70.00	50.00

(Please state voltage and current when ordering.)

C-16067 Oven—Thelco Electric—Double Walled—A new Thelco product designed along similar lines to No C-16065 above, but with double walls permitting of more perfect heat insulation and constant temperature Cast aluminum frame, door and racks with cast iron base, removable heating element, bimetallic thermostat with range from room temperature to 160°C placed outside oven eliminating danger of ignition when drying or evaporating ether extracts, pilot light for rapid temperature adjustment Furnished with two shelves of adjustable height with detachable cord and plug; No B having single door and No A double doors.

No.	A	B
Height, cm	41	31
Width, cm.	46	25
Depth, cm	23	25
Each	80.00	60.00

(Please state voltage and current when ordering.)



C-16110

C-16110 Oven—Drying, Electric Constructed of asbestos compound bound with metal, special heating units can be supplied for certain kinds of work, range of temperature is from 50° to 160°C and is accurate to within 1°C.; furnished with three shelves, the lower one having highest temperature; controlled without use of multiplied or lever arrangement and gives positive action, weight, 32½ lb.; height, 25 cm.; width, 31 cm.; depth, 25 cm.
Each ....Net 35.00

(Please state voltage and current when ordering.)

C-16170 Oven—Vacuum—Maintains fixed temperature from 40° to 180°C; simply but ruggedly constructed; suitable for research as well as laboratory operations; dries nearly any substance without risk of decomposing, will safely dry explosive or inflammable material; heat is applied by direct contact, making possible very rapid drying; may be used as air drying oven by opening vent cock upon door, or by opening door wide, as a hot plate for evaporation or other purposes, height from table top to heating plate, 11 in; desk space, 10 x 19 in; vacuum oven dimensions, inside, above heating plate, 7 x 15 x 3½ in high; arranged for 110 and 220 volts, alternating or direct current, furnished complete with rheostat, snap switch, extension cord and plugs, one 250° centigrade thermometer, one thermometer holder, one vacuum gauge, cocks for releasing and applying vacuum
Each ....Net 225.00

(Please state voltage and current when ordering.)

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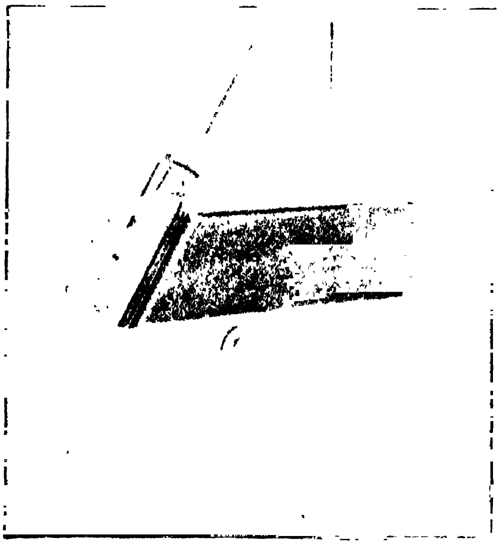


C 16170

C-16171 Oven—Vacuum Same as No C-16170 above, but 8 in high

Each . . . . Net 250.00

(Please state voltage and current when ordering)

C-16277 Pencils—Wax—For writing on glass, china, metal, etc ; white

Each 13

C-16282 Pencils—Wax—For writing on glass, china, metal, etc , blue

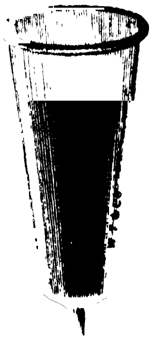
Each 13

C-16284 Pencils—Wax—For writing on glass, china, metal, etc , red

Each 13

C-16286 Pencils—Wax—For writing on glass, china, metal, etc ; yellow

Each 13

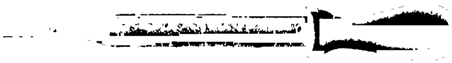


C-4585

C-4585 Percolators Conical Of heavy, flint glass

No.	C	D	E
Capacity, oz.	32	64	gal 1
Each	.60	.90	1.25
No.	**G**	**H**	**I**
Capacity, gal	2	3	4
Each	2.60	4.25	6 00

PIPETTES



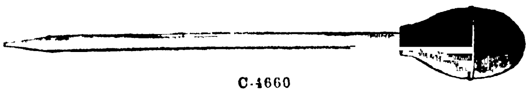
C 4640

C-4640 Pipettes—Dropping With rubber bulb, capacity, 2 cc , straight

Per dozen . .30

C-4645 Pipettes—Dropping Same as No C-4640 above, but with curved tip

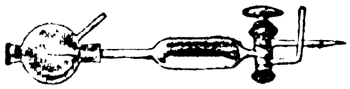
Per dozen 30



C-4660

C-4660 Pipettes—Dropping—Straight, with rubber bulb of about 20 cc capacity

No.	A	B
Length, mm	200	300
Each	.17	.20



C 4675

C-4675 Pipettes — Automatic With overflow, fitted with three-way stopcock

No.	A	B	C	D	E
Capacity, cc	10	15	25	50	100
Each	3.00	3 35	3.75	4.10	4.85

C-4690

C-4700

C 4680

C-4715

C-4718

C-4690 Pipettes—Mohr's Accurately graduated in metric system, at 20°C

No.	I	L	M	P
Capacity, cc .	1	2	2	5
Graduated, cc	1/10	1/20	1/10	1/10
Each	.21	.24	.21	.24
No.	**S**	**U**	**V**	
Capacity, cc	10	25	50	
Graduated, cc	1/10	1/10	1/10	
Each	.27	.36	.60	

Pipettes—Mohr's, Serological, graduated to the extreme tip, (No. **C-4695**) can be supplied where desired

C-4700 Pipettes—Precision—Mohr's—Graduated at 20°C , to meet the requirements of the U. S. Bureau of Standards

No.	A	C	D	E	F
Capacity, cc	1	5	10	25	50
Graduated, cc	1/100	1/20	1/10	1/10	1/5
Each	2.50	2.90	3.60	4.35	5.00

C-4680 Pipettes—Volumetric or Transfer—Straight form; for use in bacteriological work, water analysis, etc ; with one mark only; without bulb.

No.	A	B	C	D	E	F
Capacity, cc .	1	2	3	4	5	10
Each . .	.14	.14	.14	.14	.14	.15

C-4715 Pipettes—Volumetric Transfer—With glass bull in middle of tube; accurately graduated to capacities named.

No.	A	B	E	I	K
Capacity, cc . . .	1	2	5	10	15
Each	.16	.16	.16	.18	.25
No.	**M**	**N**	**Q**	**R**	**S**
Capacity, cc .	20	25	50	75	100
Each	.27	.29	.37	.47	.53

C-4718 Pipettes — Volumetric or Transfer — Precision — Graduated at 20°C, to meet the requirements of the U S. Bureau of Standards

No.	A	B	C	D	E
Capacity, cc	1	5	10	25	50
Each	1.25	1.60	1.80	1.95	2.05

Continued on Next Page

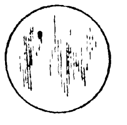
C-5830 Plates—Color—Coors porcelain, glazed throughout with exception of bottom surface

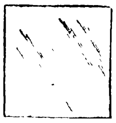
No.	1	2	3	4
Dimensions, mm	110 x 90	160 x 125	180 x 110	180 x 140
Number of depressions	12	12	24	30
Each Net	.84	1.14	1.62	1 80

C 5835

C-5835 Plates—Color Ohio porcelain, with 12 cavities for color reactions, size of plate 110 x 90 mm

Each ....Net .65


C-16320


C 16340

C-16320 Plates — Glass, Circular — Plain with edges not ground

No.	B	C	D	G
Diameter, mm	75	100	125	200
Each	.04	.06	07	.12

C-16321 Plates—Glass, Circular—Ground rough on one side, edges not ground

No.	B	C	D	G
Diameter, mm	75	100	125	200
Each	06	09	.10	.16

C-16340 Plates—Glass, Square—Plain, edges not ground

No.	B	C	D	F
Size, mm	100	125	150	200
Each	.04	06	10	.12

C-16345 Plates—Glass, Square One side ground rough, edges not ground

No.	B	C	D	F
Size, mm	100	125	150	200
Each	.06	.09	.12	.16

C-16355 Plates—Cobalt Glass—A blue glass for observing potassium flame and similar purposes, edges not ground

No.	A	B	C	E
Size, mm.	50 x 50	50 x 75	75 x 75	75 x 100
Each	.06	.10	.14	.18

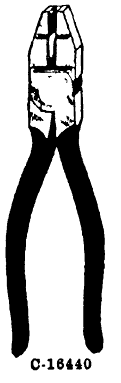
C-5925 Plates, Porous—Coors, round

No.	1	2	3
Diameter, mm	145	175	220
Thickness, mm	6	6	6
Each	Net 1.08	1.44	2.40

C-5930 Plates, Porous—Ohio, unglazed, circular, flat

No.	1	2	3
Diameter, mm	140	190	230
Each	.77	1.00	1.70

C-16460


C-16440

C-16445

Prices subject to change without notice

C-16440 Pliers — Side-cutting — Lap-joint with gun barrel handles, knurled, forged and tempered with utmost care

No.	A	B	C	D
Length, in	4	5	6	7
Each	1 40	1 50	1.60	1.90

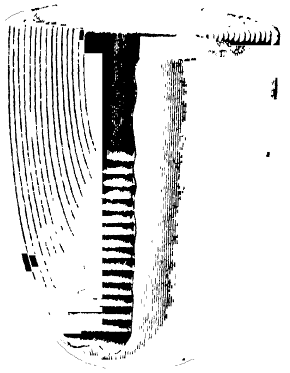
C-16445 Pliers—Combination Slip joint design permitting wider opening of pipe jaws which increases their advantages for general use, with gun barrel handles, knurled

No.	A	A1	B
Length, in	6	7	8
Each	1.05	1.30	1 55

C-16460 Pliers—Flat Nose Lap joint, with blued handles, of high quality and practically universal in their uses

No.	B	C	E	G
Length, in	3½	4	5	6
Each	.90	.90	1 00	1.05

PLATINUM WARE


C-16375

C-16375 Platinum Crucibles Supplied with covers, unless otherwise ordered, weight, with covers, approximately as many grams as capacity in cc

No.	A	B	C	D	E
Capacity, cc	8	10	12	15	20

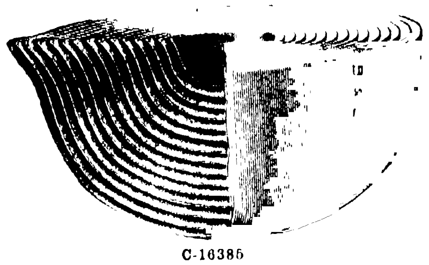
Prices on application

No.	F	G	H	I	J
Capacity, cc	25	30	35	40	45

Prices on application

No.	K	L	M
Capacity, cc	50	55	60

Prices on application


C-16385

C-16385 Platinum Dishes—Evaporating—With lip.

No.	A	B	C	D	E
Capacity, cc	20	30	45	80	125
Weight (approx.), grams	8	14	22	32	48

Prices on application

No.	F	G	H	I
Capacity, cc	200	270	370	400
Weight (approx.), grams	65	90	125	150

Prices on application

Continued on Next Page

C-16415 Platinum Triangles Solid ends

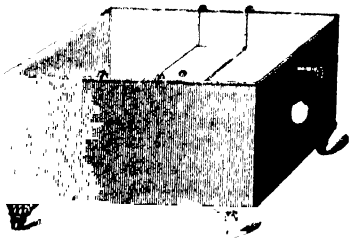
No	A	B	C	D	E	F
For crucibles of capacity, cc	10	15	20	30	40	60
Weight (approx) grams	5	8	11	12	15	18

Prices on application

C-16435 Platinum Wire All sizes from 10 to 35 Brown and Sharp gauge

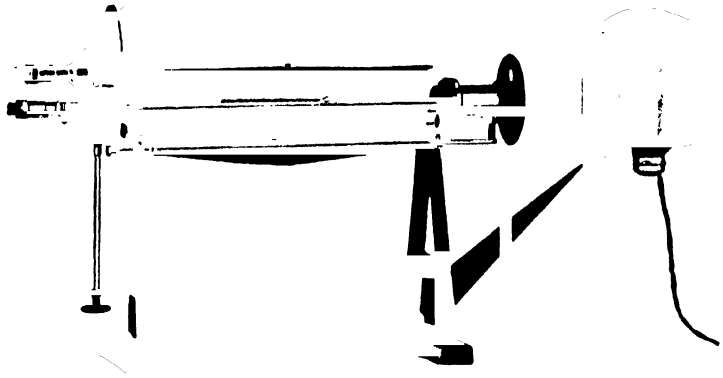
Platinum Cones, Gooch Crucibles, etc , can be supplied Let us know of your requirements

Prices on application


C-561

C-561 Pneumatic Troughs—Of japanned tin with sliding shelf and overflow

No	A	B	C	D
Length, in	10	12	15	18
Width, in	7	9	11	12
Depth, in	5	5	6	8
Each	2 00	2.15	3.00	3.85


C-570

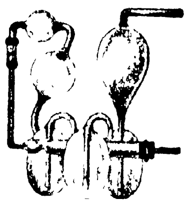
C-570 Polariscope—Saccharimeter, Bausch & Lomb—This instrument represents the consensus of opinions of American sugar men It has a double field with single quartz wedge compensation and can be supplied with polarizers of two types, namely the Lippich double prism or Jellet with fixed half shadow angle, the scale is etched on glass and read by transmitted light, instrument will accommodate tubes up to 400 mm in length, mounted on trestle support to which is attached a bracket supporting a light source, all parts easily accessible for cleaning, ordinary bichromate cell has been replaced by a glass filter of same spectral properties, scale is calibrated to read sugar degrees based on a standard weight of 26 000 grams of pure sucrose dissolved in 100 cc of water, solution and polarization of 20°C Half-shadow type with single quartz wedge compensator for 400 mm. tubes with illuminating device of white light, with one each 100, 200 and 400 mm tubes, in case

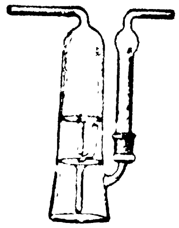
Each 525.00

A booklet descriptive of the above saccharimeter will be supplied upon request

All high grade Polariscopes, Saccharimeters, Spectrometers, Spectroscopes, and Spectrophotometers of foreign manufacture can be imported to order, but are not ordinarily carried in stock at the present time Write us for further information.

C 4765

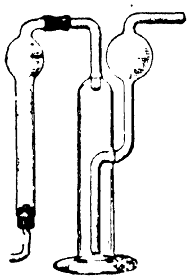

C-4770

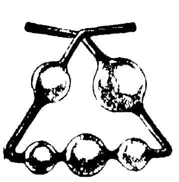

C-4775

C-4765 Potash Bulb—Fleming's—Improved form, one piece
Each . . . 3.50

C-4770 Potash Bulb — Geissler-Wetzel's — With ball float valve in each of the lower bulbs, with $CaCl_2$ tube with rubber connections
Each 3.75

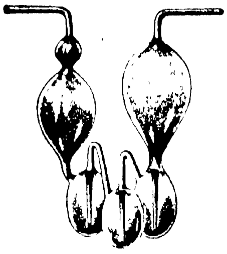
C-4775 Potash Bulb—Gomberg's—With ground-in side tube
Each 3.75

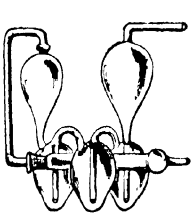

C-4780


C-4785

C-4780 Potash Bulb—Johnson's.
Each 1.50

C-4785 Potash Bulb—Liebig's—With five bulbs
Each 1.10

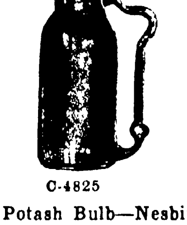

C-4805

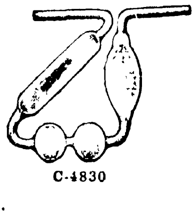

C-4820

C-4805 Potash Bulb—Mohr's.
Each 1.90

C-4815 Potash Bulb—Mohr's—With $CaCl_2$ tube with rubber connections
Each 2.60

C-4820 Potash Bulb—Mohr's—With a $CaCl_2$ tube ground on
Each 2.80


C-4825


C-4830

C-4825 Potash Bulb—Nesbit's.
Each 5.00

C-4830 Potash Bulb—Norris'.
Each 1.15

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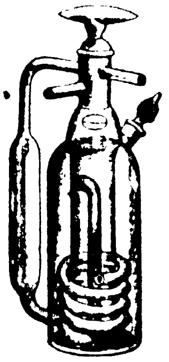
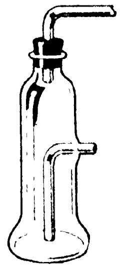


C-4835



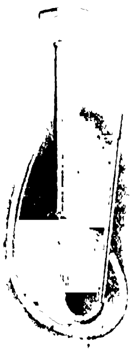
C 4837

C-4835 **Potash Bulb and Drying-tube Combined—Vanier's.**
Each . 10 00

C-4837 **Potash Bulb—Midvale type** Especially designed for use with "Ascarite"
Each . . 2 00

"Ascarite"
Per lb 4.50

PUMPS



C-16530

C-16530 **Pump, Acid—Force Pump**- Furnished with stopper that will fit bottles or carboys having necks of 1¾ to 2⅝ in inside diameter.
Each . . 9 20

C-16560

C-16560 **Pumps, Air—Crowell's Positive Pressure Blower**—Particularly useful where space is limited; horse-power required, as indicated below, is based upon pressure of about one pound per square inch, being increased proportionately for each additional pound of pressure over one pound; air tank is not absolutely necessary, but when steady, well-regulated blast of specified pressure is needed, it is preferable to direct blast into tank provided with relief valve, which can be regulated to give desired pressure, size of air pipe to convey the air should be as large as the nipple or short pipe fitted in each blower it is highly important that conducting pipes should not only be of suitable size but as free from elbows and turns as possible in order to minimize the power required to force the air through

	No. 1	2	3
Cu in capacity per rev	20	45	125
Max speed per rev.	600	500	350
Pulley size, in	4 x 1	4 x 1½	6 x 2½
Horse power, approx	⅛	¼	½
Max pressure per sq in, lb	8	8	8
Net weight, lb	24	34	90
Floor space, in.	10 x 6¼	12½ x 6½	22 x 14
Inlet and outlet, in	½	¾	1
Each Net	28 00	36 00	58 00

	No 4	5	6
Cu in capacity per rev	280	400	690
Max speed per rev	250	200	200
Pulley size, in	9 x 3	10 x 3	12 x 4
Horse power, approx	1	1½	2
Max pressure per sq in, lb . .	8	8	8
Net weight, lb	170	225	320
Floor space, in .	28 x 17	34 x 20	38 x 20
Inlet and outlet, in	1½	2	2
Each . . . . . Net	75 00	110 00	150 00

	No. 8	10
Cu in capacity per rev . . .	1050	1660
Max speed per rev	200	200
Pulley size, in	14 x 6	18 x 6
Horse power, approx	3½	5
Max pressure per sq in, lb	8	8
Net weight, lb . .	575	770
Floor space, in	48 x 22	54 x 28
Inlet and outlet, in	2½	3
Each Net	210 00	280.00

C-16615

C-16615 **Pump—Vacuum** Has large capacity, yet is compact and simple to operate, requires little power; is of positive displacement type, with all parts immersed in a bath of oil, which makes joints air-tight and lubricates moving parts, it never sucks back, making it desirable for filtration and distillation work, can be moved from place to place, size of base, 7 x 18 in, height over all, 14 in, vacuum, at sea level, 29 in; normal speed, 400 R P M, displacement free air per minute, 3500 cu in, furnished complete with pump, motor, detachable plug and 6-ft cord for attaching to any lamp socket; for direct current

No.	A	B
Voltage	110	220
Each . . . . Net	125.00	125.00

C-16620 **Pump—Vacuum**—Same as No C-16615 above, but for alternating current

No.	A	B
Voltage	110	220
Each . . . . Net	125.00	125.00

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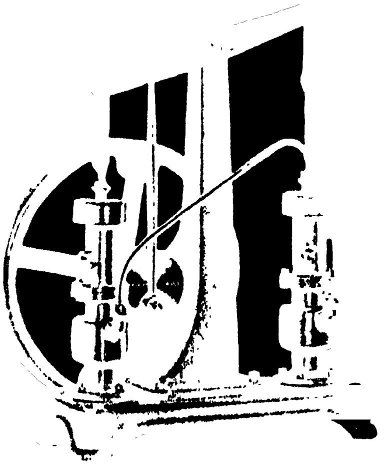
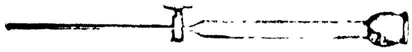


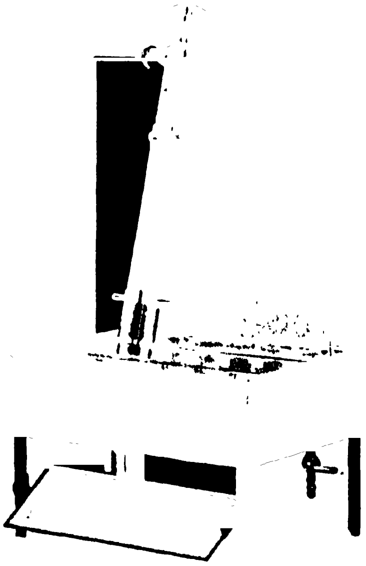
C-580

C-580 Pump—Vacuum—Geryk Of duplex type for exacting laboratory requirements and continuous operation in plants, constructed on hydraulic principle by which friction is reduced to a minimum, working joints oil sealed and self adjusting, all valves automatic, high vacuum produced much more quickly than in large Sprengel pumps, cylinders 2" diameter, stroke 5"
Each . Net 185 00



C 4890

C-4890 Reductor—Jones For the determination of phosphorus by a rapid method, as described in Blair's 'Analysis of Iron' (5th edition, page 93), tube only with glass stopcock
Each . . 2.70



C-16680

Refractometer, Dipping—Bausch & Lomb—This instrument excels in accuracy all other refractometers with the possible exception of the Interference Refractometer This, combined with the simplicity of operation, makes it a highly desirable instrument With a little experience an observer can easily repeat measurements to within 0 2 of a scale division and under favorable conditions to 0 1.

The refractometer consists essentially of three parts

1 The Telescope
2 The Compensating Prism
3 The Dipping Prism

The scale from which the readings are taken is engraved on the plano surface on the lower lens of the eyepiece of the telescope

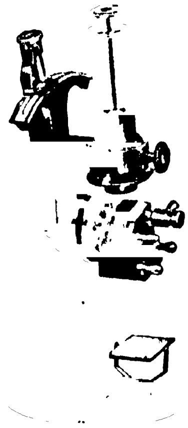
The compensating prism is a regular Amici prism It is mounted in front of the objective and is rotatable about the telescope axis by means of the middle ring

The dipping prism is mounted in front of the compensating prism It is made of a hard acid resisting crown glass The performance of the instrument as a whole depends to a great extent upon the accuracy of the workmanship of this prism

We recommend the use of the constant temperature tank in connection with the refractometer It enables one to take measurements much more conveniently and quickly and the results obtained are more satisfactory If several liquids are to be compared they can be easily brought to the same temperature by placing the beakers containing the liquids in the rack in the tank

The instrument is packed in a neat wooden case for protection and easy transportation, and is furnished with transposition tables and directions

C-16680 Dipping Refractometer, in case with tables
Each 200.00



C-590

C-590 Refractometer — Abbé, Bausch & Lomb — The most satisfactory instrument for the determination of refractive indices from 1 3000, to 1 7000, this large range making it a practically universal application for fluids, solids and plastic body. Can be used with white light and dispersion measured directly A few drops only needed for examination and refractive index read direct on sector With heatable prisms complete with screw thread thermometer, 0° to 75°C, bottle of monobromonaphthalene, screw driver and test plate, in case
Each 320.00

C-593 Spiral Water Heater, copper, for use with above
Each 45.00

C-596 Water pressure regulating tank—For wall, for use with the above
Each 5.00

C-599 Water pressure regulating tank—For table, for use with the above.
Each 4.00

C-600 Stem Thermometer—Scale range 0°-75°C. divided in 1/1° with threaded adapter
Each 2.75

A booklet descriptive of this refractometer will be forwarded on request.

C-16680-A Auxiliary Prism, for very small samples.
Each 9.00

C-16680-B Heating Trough, with glass plate in bottom, mirror and 24 beakers.
Each 23.00

Continued on Next Page

C-16680 Extra beakers.

Each	.12

C-16680-D Steam Thermometer, 15°-20° C divided in 1/5°, 8 in long with 5 in section of scale, with red line at 17.50° C

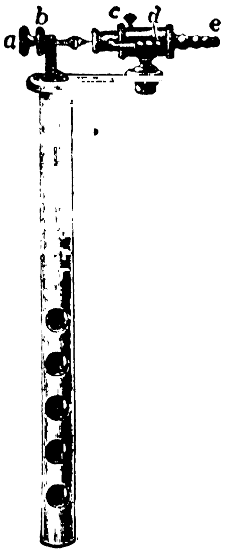
Each	4 50

C-16680-E Spiral Water Heater (copper)

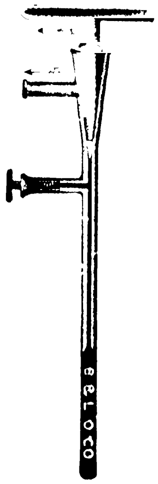
Each	45 00

C-16680-F Water-Pressure Regulating Tank, for wall

Each	5 00



C-16698



C-16730

C-16697 Regulator, Roux Bimetallic—An accurate regulator made without the use of mercury or glass, most accurate of the gas regulators, yet simple in operation, can be adjusted to regulate an even temperature more constantly than others large size

Each	15 20

C-16698 Regulator, Roux Bimetallic Small size

Each	13 50

C-16700 Regulator, Roux Bimetallic For high temperatures

Each	18 50

C-16730 Regulator, Thermo—Reichert's—For high temperatures

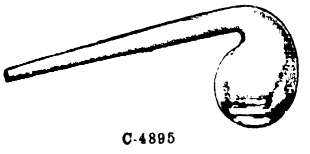
Each	3.50

C-16735 Regulator, Thermo—Reichert's—For low temperatures.

Each	3.50

C-16740 Regulator, Thermo—Reichert's—Short form for water baths

Each	3.50



C-4895

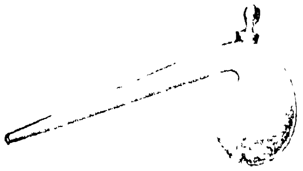
C-4895 Retorts—Of glass, plain

No.	C	E	F	G	H
Capacity, cc	75	150	250	500	1000
Each	.70	.80	.90	1.00	1.25

C-4897 Retorts—Pyrex—With tubulature, but without stopcock

No.	A	B	C	D
Capacity, cc	125	250	275	500
Each	1.60	2.00	2.50	3.00

Prices subject to change without notice



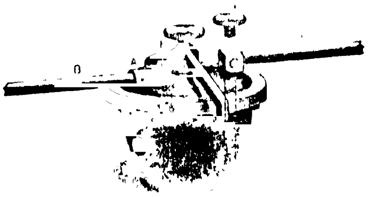
C 4900

C-4900 Retorts With ground glass stopper

No	C	D	E	F	G
Capacity cc	75	150	250	500	1000
Each	1 30	1 50	1 60	1 80	2 00

C-4902 Retorts—Pyrex With ground glass Pyrex stopper

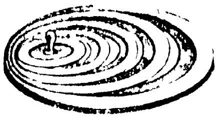
No	A	B	C	D
Capacity cc	125	250	275	500
Each	2 60	3 00	3 50	4 00



C 605

C-605 Retorts—Skidmore Crucible Of thin spun iron which permits of rapid cooling, with clamp and distillation tube

No	A	B
Capacity, oz	1½	6
Each	1.40	2.10



C-16770

C 16780

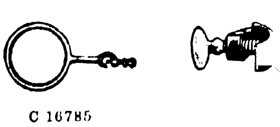
C-16770 Rings—Concentric—Of copper, tinned inside, for water baths, etc, with cover

No.	A	B	C	D
No in set	3	4	5	5
Diameter, outside, mm	100	125	140	150
Per set	.95	1 10	1 30	1.45

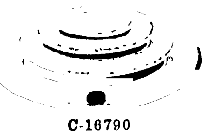
No.	E	F	G
No in set	7	8	9
Diameter, outside, mm	200	250	300
Per set	2 50	4.25	7.50

C-16780 Rings—Support—With extension, to be used with clamp holder

No.	A	B	C	D
Diameter, mm	75	100	130	175
Each	.15	17	.20	.26



C 16785



C-16790

C-16785 Rings—Support—Applicable to any support; with clamp

No.	A	B	C	D
Diameter, mm.	75	100	130	175
Each	.23	.26	.28	.38

C-16790 Rings—Of cast iron, with clamp for use on retort stand, to support funnels, dishes, etc, etc

No.	A	B
Diameter, outside, mm	150	200
No. in set	3	4
Each	1.05	1.35

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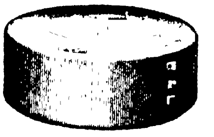
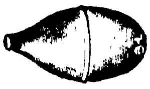


C 17595

C-17595 Rings, Suberite For supporting flasks, dishes, etc., are superior to straw rings commonly used for this purpose, being neater and more durable

No.	A	B	C	D	E	F
Diam (inside), mm	30	60	90	120	150	180
Each	.40	80	90	1 60	1.90	2 25

C 16795



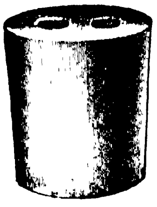
C-16800

C-16795 Rubber Bulbs Of pure gum, for small pipettes

No.	A	B	D
Capacity, cc	2	3	10
Per dozen	.20	.22	.30

C-16800 Rubber Bulbs For large pipettes, syringes, etc

No.	A	B	C
Length, mm	60	80	90
Diameter, mm	32	38	45
Each	20	.24	.26



C 16860

C-16860 Rubber Stoppers Pure gum, best quality, will not harden, unsurpassed in purity and resistance to chemicals, supplied solid, unless ordered with one or two holes, length, 25 mm

No.	00	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Diameter, top, mm	14	17	18	20	23	25	27	32	37	41	45	50	56	65	70
Diam, bottom, mm	10	12	15	16½	18	20	23	26	30	33	37	42	50	59	60
Approx number with two holes, in one lb	148	101	67	59	44	36	32	22	15	13	11	8	7	5	4
Per pound	1.10					1.10					1.10				

C-16865 Rubber Tissue Of best quality

Per oz	30
Per lb	4 00

C-16870 Rubber Tubing Black, pure gum, best quality, seamless, will not harden, very desirable, original length, 3½ meters (12 ft)

No.	A	B	C	D	E	F	G
Diameter, inside, mm	3	4	5	6	8	9	12
Per foot	.04	.04	.06	.10	.12	.14	.22

C-16875 Rubber Tubing—Black, same as No **C-16870** above, but heavy wall.

No.	A	B	C	D	E	F	G	H	I
Diam, inside, mm	3	4	5	6	8	9	12	15	18
Per foot	.07	.08	.14	.15	.20	.23	.42	.48	65

C-16880 Rubber Tubing— Pure gum, very elastic, for Gooch crucibles

No.	A	B	C	D	E
Diameter, mm	25	30	40	45	50
Per foot	.09	.10	.12	.15	.18

C-16885 Rubber Tubing Red or antimony, very best quality.

No.	A	B	C	D	E	F	G
Diameter, inside, mm	3	4	5	6	8	9	12
Per foot	.04	.05	.08	10	.18	.24	.28

C-16890 Rubber Tubing Red or antimony, same as No **C-16885** above, but heavy wall

No.	A	B	C	D	E	F	G	H	I
Diam, inside, mm	3	4	5	6	8	9	12	15	18
Per foot	05	.07	.11	12	18	.32	.34	.48	.65

C-16895 Rubber Tubing—Cloth Impression Extra quality, very flexible; will not split, air-tight and suitable for gas or liquid, hand-made

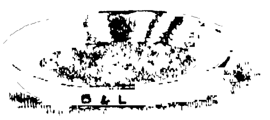
No.	A	B	C	D	E	F	G
Diameter, inside, mm	3	4	5	6	8	9	12
Per foot	.03	03	.05	.06	.09	.14	19

C-16900 Rubber Tubing—Cloth Impression Same as No **C-16895** above, but double thickness

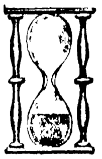
No.	A	B	C	D	E	F	G	H	I
Diam, inside, mm	3	4	5	6	8	9	12	15	18
Per foot	.05	.05	.07	14	15	.17	.24	.26	.35

C-16905 Rubber Tubing — Pressure—For use with filter pumps, etc.

No.	A	B	C	D	E	F	G
Diameter, inside, mm	3	4	5	6	8	9	12
Per foot	.07	.10	.25	.27	.35	.45	.50



C-16925



C-16940

C-16920 Sand Baths—Deep form, of sheet steel

No.	A	B	C	D	E	F	G	H
Diameter, mm	50	75	100	125	150	175	200	250
Each	.08	.09	.11	.20	.24	.35	.50	1.05

C-16925 Sand Baths—Shallow form; of sheet steel.

No.	A	B	C	D
Diameter, mm	50	75	100	125
Each	.08	.09	.11	.16

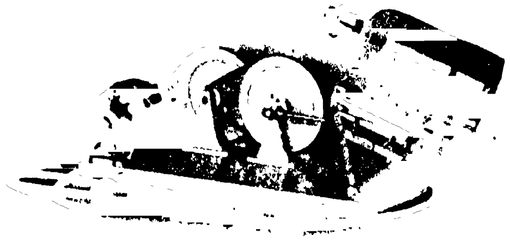
Continued on Next Page

No.	E	F	G	H
Diameter, mm	150	175	200	250
Each	19	.28	.35	70

C-16940 **Sand Glasses,** in polished wooden stands

No	C	D	E	F	G
Time, minutes	1	2	3	5	10
Each	1 00	1 00	1.20	1 50	1 75

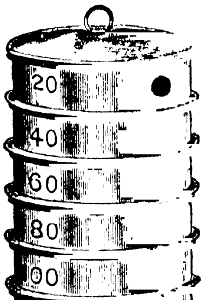
C-610 **Sand Paper** In sheets 9" x 11" and in fine, medium, or coarse grades Please specify grade desired
Per dozen sheets . 25



C-615

C-615 **Shaking Machine—Will** -An apparatus of new design accommodating accessories by which a 250 cc. Erlenmeyer flask, one bottle up to 500 cc capacity or four test tubes of various sizes may be thoroughly shaken Operated by a 1/20 H P 110 volt universal motor with rheostat control regulating oscillations of table from 240 to 360 per minute, speed reduction by grooved pulleys set very closely together, with eccentric actuating the shaking platform, mounted rigidly on cast-iron base, white enameled, 6 feet of cord and plug Complete with accessories
Each .. .. Net 85 00

C-617 **Shaking Machine—Will**- Same as above, but with 220 volt universal motor
Price on application



C-625-35

C-625 **Sieves—Brass Frame**—Seamless brass gauze, very well made, diameter, 5 in

No.	A	B	C	D
Mesh	20	40	60	80
Sieve only, each	1.70	1.70	2.10	2 20
No.	**E**	**F**	**G**	**H**
Mesh	100	120	150	200
Sieve only, each	2.30	2.55	3.15	4 75

C-628 **Cover**—For above
Each .... .85

C-630 **Bottom**—For above
Each .... .70

C-635 **Sieves** same as No **C-625** above, but of 8 in diameter

No.	A	B	C	D
Mesh	20	40	60	80
Sieve only, each	2.80	3.00	3.15	3.25

Prices subject to change without notice

No.	E	F	G	H
Mesh	100	120	150	200
Sieve only, each	3 40	4.35	5.70	8.10

C-638 **Cover** For above
Each 1.05

C-640 **Bottom** For above
Each 85

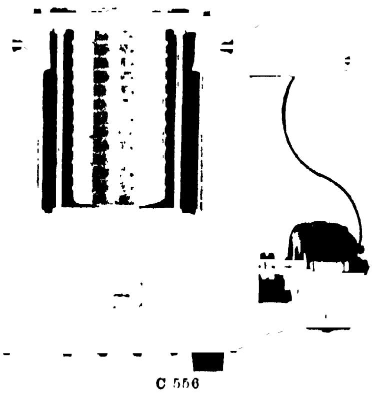
C 645

C-645 **Sieves—Standard Testing** With brass frame and gauze in accordance with the specification of the American Society for Testing Materials, diameter 8 inches

No	A	B	C	D	E
Mesh	10	20	30	40	50
Sieve only, each	Net 4 05	4 05	4.05	4.05	4.75
No.	**F**	**G**	**H**	**I**	**J**
Mesh	60	70	80	90	100
Sieve only, each	Net 4 75	4.95	5.40	5.80	6.25
No.	**K**	**L**	**M**	**N**	**P**
Mesh	110	120	130	140	150
Sieve only, each	Net 6 45	6.70	7 20	7.55	8.10
No.	**Q**	**R**	**S**	**T**	**V**
Mesh	160	170	180	190	200
Sieve only, each	Net 8 40	9.30	10.15	10.70	11.00

C-648 **Cover** For above
Each . . . . Net 3.00

C-650 **Bottom** For above
Each . . . Net 3.00



C 556

C-556 **Sieve Shaking Apparatus — "Ro-Tap"** — Reproduces absolutely the circular and tapping motion given testing sieves in hand-sieving but with a uniform mechanical action producing dependable sizing tests, makes possible the standardization of processes and the obtaining of correct data for the plotting of graphical screen analyses. From 1 to 13 sieves can be shaken in one operation Operated by 1/6 horse power motor, running parts operating in oil and no foundation being required The "Stop-Rite" time switch eliminates errors in timing and makes operation of machine practically automatic For 110 V. A C or D C. Without time switch
Each ... .Net 360.00
(Please specify current when ordering.)

C-557 **"Stop-Rite" Time Swcith** for above
Each ....Net 33.00

Continued on Next Page

C-560 Sleeves Of rubberized material, for use in laboratory

Per pair .	1.00

C 16980

C 16985

C-16980 Spatulas — Horn Best quality with spatula on each end

No	A	B
Length, mm	100	125
Each	16	.19
No	**C**	**D**
Length, mm	150	200
Each . .	20	42

C-16985 Spatulas—Nickel—Solid, with spatula on each end, length 180 mm

Each .	.75

C 5880

C 5890

C-5880 Spatulas Coors porcelain, glazed throughout, spatula both ends

	No	1	2	3
Length mm		105	120	150
Each	Net	30	.42	.50
	No	**4**	**5**	**5a**
Length, mm		195	212	225
Each	Net	.66	86	1.02
	No	**6**	**7**	
Length, mm		280	318	
Each	Net	1 48	1 87	

C-5890 Spatulas Coors porcelain, spoon on one end, spatula on other

	No.	1	1a	2	3
Length mm		96	120	110	160
Each .	Net	25	32	.46	60
	No.	**4**	**4a**	**5**	**6**
Length, mm		190	203	247	490
Each	. . . Net	.72	90	1 02	3 30

C-16995

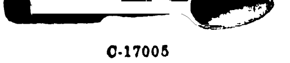
C-16990

C-16990 Spatulas—Steel—Flexible steel blade with steel handle, nickel-plated

No.	A	B	C	D
Length of blade, mm	75	100	125	150
Each	.65	.70	.80	.85
No.	**E**	**F**	**G**	
Length of blade, mm	200	250	300	
Each	1.20	2.10	3.55	

C-16995 Spatulas—Steel—So-called palette knife, flexible steel blade, with wooden handle

No.	A	B	C	D
Length of blade, mm	75	100	125	150
Each	.45	.48	.50	.60
No.	**E**	**F**	**G**	**H**
Length of blade, mm	175	200	250	300
Each	.75	.95	1.50	2.50



C-17005

Prices subject to change without notice

C-17000 Spoons—Bone—Best quality, length, 80 mm

Each	.25

C-17005 Spoons—Bone With spatula end

No.	A	B
Length mm	150	170
Each	.30	35

C-580 Spoons—Deflagrating—Of heavy iron

No.	A	B
Diameter of spoons in .	½	¾
Each . . .	.13	.14

C-585 Spoons—Deflagrating—Of heavy brass

No.	A	B
Diameter of spoons in	½	¾
Each	.18	21

C-4925 Spoons—Glass Of heavy pressed glass

No.	A	B	C
Size .	Teaspoon	Dessertspoon	Tablespoon
Each	.50	80	1.40

C-17010 Spoons—Horn Best quality

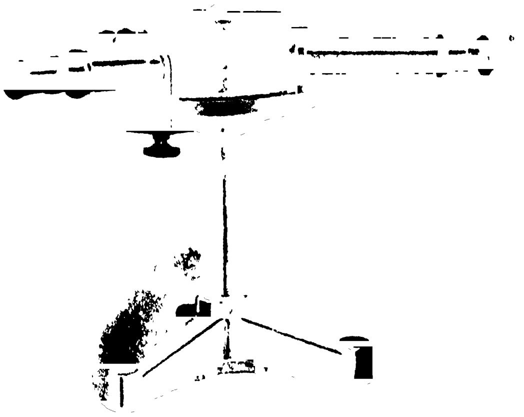
No.	B	C	D	F	G	J
Length, mm	100	120	150	200	220	300
Each	.15	17	25	.38	.46	1 35

C-17015 Spoons—Horn—With spatula end

No.	B	C	D	F	J
Length, mm	100	120	150	200	300
Each	21	25	30	.46	1.45

C-17020 Spoons—Pure Nickel—With spatula end, length, 180 mm

Each	.75



C-665

C-665 Spectroscope—The collimator and the telescope objectives are of 25 mm aperture and about 160 mm focal length The lenses are achromatic and of the best quality The prism is mounted on a prism table which is accurately adjusted for the prism provided and has three leveling screws The slit is of adjustable width and 10 mm length The telescope rotates about the axis of the instrument by means of a tangent screw, over a sufficient angle to permit ready observation of the entire spectrum It is provided with simple draw tube for focusing The scale tube is mounted at the proper angle to secure full reflection from the face of the prism. The tube with its mount can be rotated about the axis of the instrument to bring the scale image to the proper position, by loosening a screw underneath, which passes through a slot in the frame. The scale is a photographic negative having 16 figured divisions, each divided to tenths The visible spectrum covers about ten divisions equal to about 40 degrees.

Each ....Net 82.50

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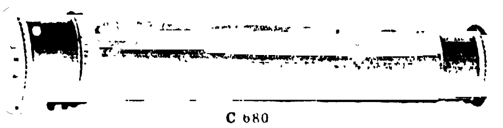


C 680

C-675 **Spectroscope, Direct-vision** This instrument is provided with prism showing the principal Fraunhofer lines, and with adjustments whereby it can be focused for different eyesights The slit is protected by means of a glass plate, thus preventing dust from lodging on it With nickel tube mounted on polished wooden support

Each	18 00

C-680 **Spectroscope** only, same as No C-675, but without support, in box

Each	18 00

C-685 **Spectroscope** Same as No C-675, with attachment for holding tube for absorption spectral experiments

Each	20 00

C-690 **Spectroscope, Direct-vision** With five prisms achromatic lenses, and adjustable slit Will show many of the Fraunhofer lines, the bright lines of metals and gases, and the absorption bands in colored glass crystals or liquids Length, 75 mm, diameter, 18 mm Complete in morocco case

Each	22 50

C-695 **Spectroscope**- Same as No C-690, with comparison prism

Each	30 00

STILLS, WATER

Stills, Water, Barnstead Stills of this manufacture include four types, viz Laboratory, Commercial, Druggists and Home Types The stills are constructed on the regenerative principle, water being preheated before entering the still, and are continuous and automatic in operation The construction is of cold-rolled copper, tin-lined, condensers consisting of tinned copper and tinned brass tubes These stills may be had in capacities from one quart to one hundred gallons per hour Heating is accomplished by steam, gas, electrical unit or kerosene

C-17465 **Laboratory Type—Gas Operated.**

Capacity, gals, per hour	1	1½	2	5	10
Shipping weight, lb	70	75	85	100	410
Each	Net 60 50	75 00	96 80	165 00	330 00

C-17470

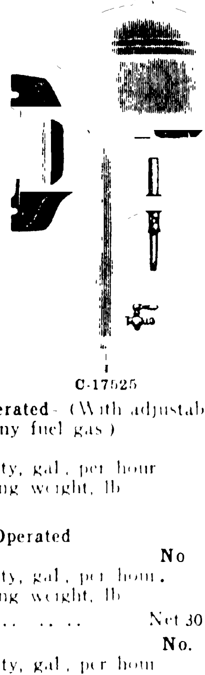
C-17470 **Laboratory Type—Electrically Operated.**

Capacity, gals, per hour	1	1½	2	5	10
Consumption in K W per hour	2 4	4	6	12	24
Shipping weight lb	68	75	85	100	400
Each	Net 75 90	96 80	121 00	297 00	580.00

C-17475 **Commercial Steam Type.**

Capacity, gals, per hour	1	2	5 7	10 15	15 20
Shipping weight, lb.	70	75	85	150	300
Each	Net 72 60	104 50	154.00	220 00	330 00
Capacity, gals, per hour	20 25	25 30	50	75	100
Shipping weight, lb	450	600	750	1200	1400
Each	Net 412 50	522 50	700 00	900 00	1200 00

Stills, Water, Stokes' These stills are of the wall type, are regenerative in principle and automatic in operation The condenser cylinder and boiling chamber and other parts with which the raw water comes into contact are made of cast-iron, the condenser tubes and all portions with which the distillate comes in contact are of tin-lined brass The exterior of the gas-heated stills is finished with aluminum paint and the covers are porcelain lined The larger sizes are painted blue gray and have tin-lined copper covers These stills may be had in capacities from one-half to two and three-quarter gallons per hour when heated by gas, steam operated stills may be obtained in sizes from one to one hundred gallons per hour Kerosene heated stills are manufactured in a one-half gallon per hour size only



C-17525

C-17525 **Gas Operated**- (With adjustable burner for the use of any fuel gas)

No	A	B	C
Capacity, gal, per hour	½	¾	2¼
Shipping weight, lb	70	200	200
Each	Net 25 00	27.00	60.00

C-17530 **Steam Operated**

No	A	B	C	D
Capacity, gal, per hour.	¾	2¾	5	10
Shipping weight, lb	70	200	350	425
Each	Net 30 00	75.00	150.00	200.00

No.	E	F	G
Capacity, gal, per hour	25	60	100
Shipping weight, lb	875	1425	1750
Each	Net 300 00	500.00	750.00

C-17531 **Gas and Steam Operated.**

No.	A
Capacity, gal, per hour	½
Shipping weight, lb	70
Each	Net 31.00

C-17535 **Gasolene Operated.**

	Gasoline Operated	Kerosene Operated
No.	A	B
Capacity, gal, per hour	½	½
Shipping weight, lb	70	70
Each	Net 37.50	37.50

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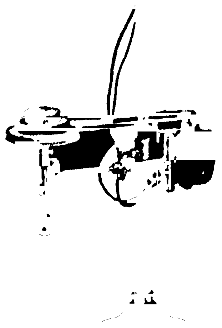


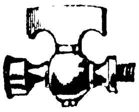
C 17540

C-17540 Stirring Apparatus Has electric motor, adjustable bracket, spindle with chuck for holding stirrer blades and three-step pulley; furnished complete with rheostat for controlling speed, for alternating current

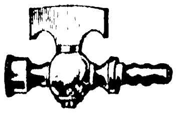
No.	A	B
Voltage	110	220
Each	Net 37.50	41.25

C-17545 Stirring Apparatus Same as No C-17540 above, but for direct current

No	A	B
Voltage	110	220
Each	Net 37.50	41.25



C 17550



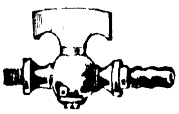
C-17565

C-17550 Stopcocks—Brass—One end with male screw, other with female screw.

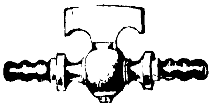
No.	A	B
Bore, mm	3	6
Each	1 00	1.45

C-17565 Stopcocks—Brass—One end for tubing, other with male screw.

No.	A	B
Bore, mm	3	6
Each	1 00	1.45



C 17570



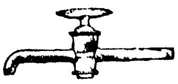
C 17575

C-17570 Stopcocks—Brass One end for tubing, other with female screw

No.	A	B
Bore, mm	3	6
Each	1.00	1.45

C-17575 Stopcocks—Brass Air and gas tight, both ends for tubing

No.	A	B
Bore, mm	3	6
Each	1.00	1.45



C-4930

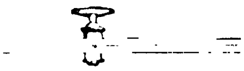
C-4935

C-4930 Stopcocks—Glass—Geissler's—With curved outlet

No.	A	B	C	D	F
Diam of bore, mm	1	2	3	4	6
Each	.60	.65	.80	.90	1.35

C-4935 Stopcocks—Glass—Geissler's—Straight

No.	A	B	C	D	F
Diam of bore, mm	1	2	3	4	6
Each	.60	.65	.80	.90	1.35



C 4940

C-4940 Stopcocks—Glass—Geissler's — Straight, with inlet and outlet of capillary tubing, from 6 to 7 mm outside diameter

No.	A	B
Diameter of bore, mm	1	2
Each	.65	.70

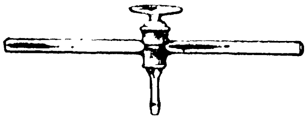
C-4950

C-4945 Stopcocks — Glass — Geissler's Latest Form—Two-way, with plug bored at an angle, absolutely air-tight and will not leak

No.	A	B
Diameter of bore, mm	2	4
Each	.80	1.10

C-4950 Stopcocks—Glass—Geissler's Latest Form—Same as No C-4945 above, but with capillary tubing; diameter of bore, 2 mm

Each 1.00



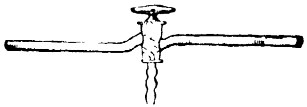
C-4955

C-4955 Stopcocks — Glass — Geissler's — Three-way; with downward outlet at end of stopper for rubber connection

No.	A	B	C
Diameter of bore, mm	1	2	4
Each	.80	.90	1.35

C-4960 Stopcocks—Glass—Geissler's—Same as No C-4955 above, but with capillary tubing

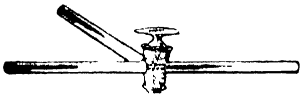
No.	A	B
Diameter of bore, mm	1	2
Each	1 35	1.40



C-4965

C-4965 Stopcocks—Glass—Three-way, with oblique bore, with downward outlet at end of stopper for rubber connection

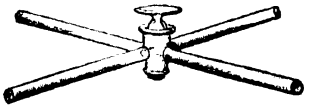
No.	A	B
Diameter of bore, mm	2	4
Each	1.00	1.60



C-4970

C-4970 Stopcocks—Glass—Geissler's—Three-way.

No.	A	B	C
Diameter of bore, mm	2	3	4
Each	.80	.90	1.00



C-4980

C-4980 Stopcocks—Glass—Geissler's—Four-way.

No.	A	B	C
Diameter of bore, mm	2	3	4
Each	1.15	1.35	1.60

Prices subject to change without notice

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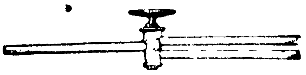
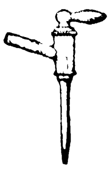


C-4985



C 5020

C-4985 Stopcocks—Glass—Three-way, with stopper having two oblique bores, and with two outlets on one side

	No. A	B
Diameter of bore, mm	2	4
Each	1.15	1 95

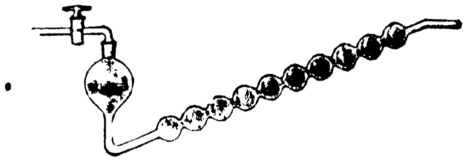
C-4990 Stopcocks—Glass—Same as No **C-4985** above, but with capillary tubing, with 2 mm bore each
Each . . 1 30

C-5015—Stopcocks—Glass—Straight, of light weight for making burette tips, etc, with drawn out tip

	No. A	B	C
Diameter of bore, mm	1	2	3
Each	65	.70	.80

C-5020 Stopcocks—Glass—Fresenius'—Angle form, for burette tips, etc, with drawn-out tip

	No. A	B
Diameter of bore, mm	1	2
Each	.75	80



C-5065

C-5060 Sulfur Apparatus—Meyer's—For the determination of carbon in iron and steel by the use of barium hydrate, and the determination of sulfur by the aid of bromine, without stopcock, with 10 bulbs
Each 1 80

C-5065 Sulfur Apparatus—Meyer's—Same as No **C-5060** above, but with stopcock, with 10 bulbs
Each 3.00

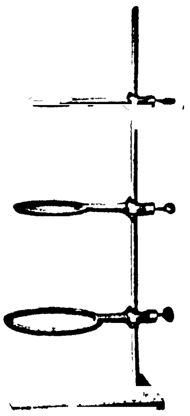
SUPPORTS

C-17600 Supports — Apparatus — Rectangular base, with screw threads of ample size, well cut and fitted

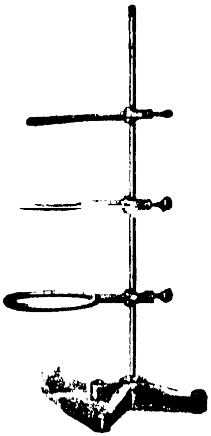
	No. A	B
Size	Small	Medium
Size of base, mm	100 x 150	125 x 200
Length of rod, mm	450	500
Each	.40	.60
	No. C	**D**
Size	Large	Extra Large
Size of base, mm	130 x 225	150 x 275
Length of rod, mm	650	900
Each	1.10	1.50

C-17605 Supports—Apparatus—Rectangular base, same as No **C-17600**, with rings

	No. A	B
Size	Small	Medium
Number of rings	2	3
Each	.90	1.35
	No. C	**D**
Size	Large	Extra Large
Number of rings	4	4
Each	2.25	2.65



C-17606



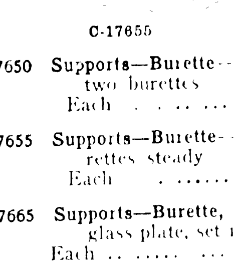
C 17616

C-17610 Supports—Apparatus—Tripod base

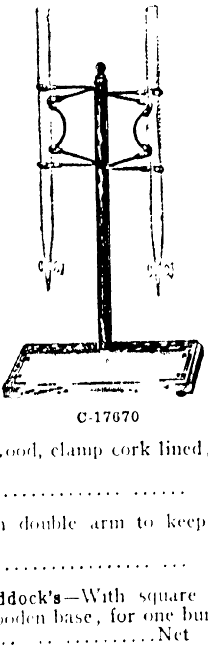
	No. A	B
Size	Small	Medium
Length of rod, mm	450	500
Each	40	.60
	No C	**D**
Size	Large	Extra Large
Length of rod, mm	650	900
Each	1 10	1.50

C-17615 Supports—Apparatus—Tripod base, same as No **C-17610**, with rings

	No. A	B
Size	Small	Medium
Number of rings	2	3
Each	.90	1.35
	No C	**D**
Size	Large	Extra Large
Number of rings	4	4
Each	2 25	2.65



C-17655



C-17670

C-17650 Supports—Burette—Of wood, clamp cork lined, for two burettes
Each 2.70

C-17655 Supports—Burette—With double arm to keep burettes steady
Each 3.15

C-17665 Supports—Burette, Chaddock's—With square milk glass plate, set in wooden base, for one burette.
Each . . . . Net 3.75

C-17670 Supports—Burette, Chaddock's—With square milk glass plate, set in wooden base, for two burettes
Each . . . . Net 4.00

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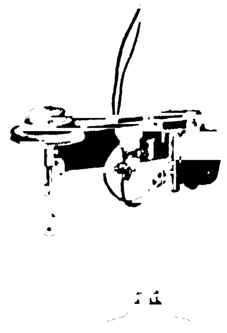


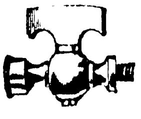
C 17540

C-17540 Stirring Apparatus Has electric motor, adjustable bracket, spindle with chuck for holding stirrer blades and three-step pulley; furnished complete with rheostat for controlling speed, for alternating current

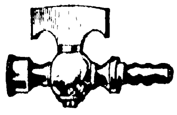
No.	A	B
Voltage	110	220
Each	Net 37.50	41.25

C-17545 Stirring Apparatus Same as No C-17540 above, but for direct current

No	A	B
Voltage	110	220
Each	Net 37.50	41.25



C 17550



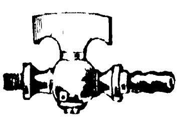
C-17565

C-17550 Stopcocks—Brass—One end with male screw, other with female screw.

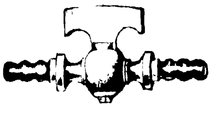
No.	A	B
Bore, mm	3	6
Each	1.00	1.45

C-17565 Stopcocks—Brass—One end for tubing, other with male screw.

No.	A	B
Bore, mm	3	6
Each	1.00	1.45



C 17570



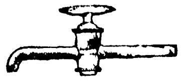
C 17575

C-17570 Stopcocks—Brass One end for tubing, other with female screw

No.	A	B
Bore, mm	3	6
Each	1.00	1.45

C-17575 Stopcocks—Brass Air and gas tight, both ends for tubing

No.	A	B
Bore, mm	3	6
Each	1.00	1.45



C-4930

C-4935

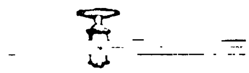
C-4930 Stopcocks—Glass—Geissler's—With curved outlet

No.	A	B	C	D	F
Diam of bore, mm	1	2	3	4	6
Each	.60	.65	.80	.90	1.35

Prices subject to change without notice

C-4935 Stopcocks—Glass—Geissler's—Straight

No.	A	B	C	D	F
Diam of bore, mm	1	2	3	4	6
Each	.60	.65	.80	.90	1.35



C 4940

C-4940 Stopcocks—Glass—Geissler's — Straight, with inlet and outlet of capillary tubing, from 6 to 7 mm outside diameter

No.	A	B
Diameter of bore, mm	1	2
Each	.65	.70

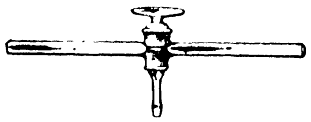
C-4950

C-4945 Stopcocks — Glass — Geissler's Latest Form—Two-way, with plug bored at an angle, absolutely air-tight and will not leak

No.	A	B
Diameter of bore, mm	2	4
Each	.80	1.10

C-4950 Stopcocks—Glass—Geissler's Latest Form—Same as No C-4945 above, but with capillary tubing; diameter of bore, 2 mm

Each 1.00



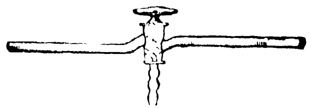
C-4955

C-4955 Stopcocks — Glass — Geissler's — Three-way; with downward outlet at end of stopper for rubber connection

No.	A	B	C
Diameter of bore, mm	1	2	4
Each	.80	.90	1.35

C-4960 Stopcocks—Glass—Geissler's—Same as No C-4955 above, but with capillary tubing

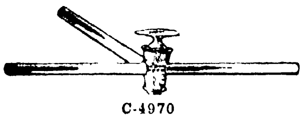
No.	A	B
Diameter of bore, mm	1	2
Each	1.35	1.40



C-4965

C-4965 Stopcocks—Glass—Three-way, with oblique bore, with downward outlet at end of stopper for rubber connection

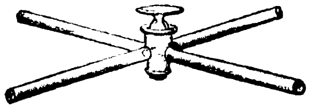
No.	A	B
Diameter of bore, mm	2	4
Each	1.00	1.60



C-4970

C-4970 Stopcocks—Glass—Geissler's—Three-way.

No.	A	B	C
Diameter of bore, mm	2	3	4
Each	.80	.90	1.00



C-4980

C-4980 Stopcocks—Glass—Geissler's—Four-way.

No.	A	B	C
Diameter of bore, mm	2	3	4
Each	1.15	1.35	1.60

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C-18033 **Test Paper**—Congo red in sheets 250 x 200 mm

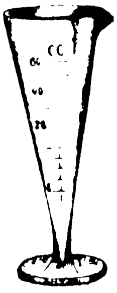
Per quire	60
Per sheet . . .	04

C-18036 **Test Paper**—Tumeric, in sheets, 250 x 200 mm

Per quire	75
Per sheet . .	07

C-18039 **Test Paper**—Lacmoid, in sheets, 250 x 200 mm

Per quire .	75
Per sheet	07


C-5095

C-5090 **Test Glasses**—For collecting sediments, of best, resistance glass, conical form, with foot and pour-out

No.	A	B	C	D	E	F
Capacity, cc	30	60	125	200	250	500
Each	.38	.45	.54	.68	.83	.98

C-5095 **Test Glasses**—Same as No C-5090 above, but graduated in the metric system

No.	A	B	C	D	E	F
Capacity, cc	30	60	125	200	250	500
Each	.53	.70	.90	1 05	1 20	1.35

C 5110

C-5105

C-5105 **Test Tubes**—With lip, thin wall, even thickness; of best selected quality, free from bubbles and strae, well annealed, wrapped separately in paper

No.	6	7	14	16	21	22
Length, mm	75	75	100	100	120	120
Diameter, mm	9	11	12	16	13	16
Per gross	1.75	1.90	1.95	2.70	2 55	3 00

No.	23	28	29	30	31	33
Length, mm	120	150	150	150	150	150
Diameter, mm	18	12	16	18	20	25
Per gross	3.15	2.80	3.25	3.65	4 85	6.40

No.	35	37	40	41
Length, mm.	180	180	200	200
Diameter, mm	18	22	20	25
Per gross . .	4.10	5.60	5 25	6.75

C-5107 **Test Tubes—Pyrex**—With lip, light wall

No.	A	B	C	D	E
Height, mm.	75	100	125	150	150
Diameter, mm . .	10	12	15	16	18
No in orig carton	200	200	100	150	150
Each .... Net	.06	.07	.09	.11	.12

No.	F	G	H	I	J
Height mm	175	100	150	200	250
Diameter mm	22	25	25	25	25
No in orig carton	100	100	75	50	100
Each . Net	13	15	17	.25	.36

No	K	L	M	N	O
Height mm	300	200	300	200	300
Diameter mm	25	29	29	32	32
No in orig carton	75	75	50	75	25
Each Net	40	40	45	.48	54

No	P	Q	R	S
Height, mm	200	300	400	500
Diameter, mm .	38	38	50	65
No in orig carton	25	25	1	1
Each Net	.56	72	1 25	1 78

If ordered in original carton, less 10% discount

C-5110 **Test Tubes**—Without lip, heavy wall, round bottom, of same quality as No C-5105 above

No	1	5	9	10	11
Length, mm	50	75	100	100	100
Diameter, mm	8	11	10	12	15
Per gross .	1 55	1 95	2 05	2 10	2 42

No	15	16	17	23	25
Length, mm	120	120	120	150	150
Diameter, mm	12	16	18	12	16
Per gross	2 55	3 00	3 15	2.80	3 15

No.	26	27	31	33
Length, mm	150	150	180	200
Diameter, mm	18	20	22	25
Per gross	3 60	4 00	5 60	7.15

C-5112 **Test Tubes—Pyrex**—Without lip, light wall

No.	A	B	C	D	E
Height, mm. .	75	100	125	150	150
Diameter, mm	10	12	15	16	18
No in orig carton	200	200	100	150	150
Each . . . . Net	05	06	08	.10	.11

No.	F	G	H	I	J
Height, mm .	175	100	150	200	250
Diameter, mm	22	25	25	25	25
No in orig carton	100	100	75	50	100
Each Net	12	.14	16	24	.34

No.	K	L	M	N	O
Height, mm	300	200	300	200	300
Diameter, mm	25	29	29	32	32
No in orig carton	75	75	50	75	25
Each . Net	38	38	43	44	.50

No.	P	Q	R	S
Height, mm	200	300	400	500
Diameter, mm .	38	38	50	65
No in orig carton	25	25	1	1
Each . Net	52	68	1 19	1 67

If ordered in original carton, less 10% discount

C-5113 **Test Tubes—Pyrex**—Without lip, heavy wall, so-called "Ignition Tubes"

No.	A	B	C	D	E
Height, mm . .	70	100	125	150	200
Diameter, mm	10	11	16	20	25
No in orig carton	200	150	100	100	50
Each . . Net	08	.11	13	.22	.34

If ordered in original carton, less 10% discount

C-5120 **Test Tubes**—With foot and lip, of same quality as No C-5105.

No.	A	B	C	E	F
Length, mm.. ..	100	125	150	200	250
Diameter, mm	13	16	18	25	25
Each	07	.13	.17	.29	.42

C-6180 **Test Tubes — Vitreosil**—With heavy walls and flared tops, withstand high temperatures and can be cooled rapidly without breakage

No.	A	B	C	D	E	F
Length inside, mm .. .	102	127	127	152	152	178
Diam inside, mm	12-13	12-13	15 16	15-16	19	22
Each ....Net	.50	.65	.70	.80	.85	1.15

Other types and sizes made promptly to order.

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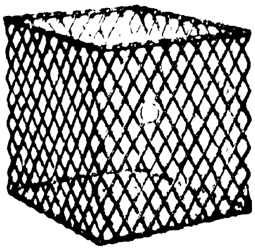


C 18080

C-18080 Test Tube Baskets Made of smooth tinned wire with very few joints for use in incubators and sterilizers

No.	A	B	C	D
Height, mm	150	150	100	150
Length, mm	150	125	125	
Width, mm	150	100	100	
Diameter, mm				125
Each	.85	.50	45	55

THERMOMETERS

C-5140 Thermometers—Ordinary quality With **Centigrade** scale etched on stem and white background Each thermometer is enclosed in pasteboard box

No.	B	D	F	H	J	L
Graduated to	100°	150°	200°	250°	300°	350°C
Each	1 00	1.10	1 20	1 30	1.40	1.55

C-5145 Thermometers—Ordinary quality Same as above, but with **Fahrenheit** scale etched on stem, and white background Those over 400°F are nitrogen-filled Each thermometer is enclosed in pasteboard box

No.	B	D	F	H	J	L
Graduated to	220°	300°	400°	500°	600°	700°C
Each	1 00	1 10	1 20	1.30	1.40	1.55

C-5150 Thermometers—Qrdinary quality Same as above, but with **Centigrade** and **Fahrenheit** scales, etched on stem, and white background Those over 200°C and 400°F are nitrogen-filled Each thermometer is enclosed in pasteboard box

No.	A	C	E	G	I	K
Graduated to	100°	150°	200°	250°	300	350°C
Graduated to	220°	300°	400°	500°	600	700°F
Each	1.40	1.50	1.70	1.75	1.80	1.95

C-5156 Thermometers—Standard quality—With **Centigrade** scale etched on stem and white background Those over 200°C are nitrogen-filled With factory certificate of accuracy

No	B	D	E
Graduated to.	-20° to 50°	0° to 105	0° to 150°C.
Subdivided in	1 5°	1/10°	1/10°
Length, mm	300	600	675
Each	6 50	14 50	16.50

No.	F	G
Graduated to	0° to 200°	0° to 250 C.
Subdivided in.	1/5°	1/5°
Length, mm	600	750
Each	15.20	18.50

C-5197 Thermometers—Paper Scale—Graduated to single degrees **Centigrade.** Diameter ⅜ inches, length about 12 inches

No.	A	B	C
Graduated to	100°	150°	250°C
Each	.75	.80	.90

Prices subject to change without notice

C-5207 Thermometers—Paper Scale—Similar to No **C-5197,** but with **Fahrenheit** graduations

No.	A	B	C	D
Graduated to	212°	300°	400°	600°F
Each	.75	.80	.90	1 10

C-5222 Thermometers—Paper Scale—Similar to No **C-5197,** but with both **Centigrade** and **Fahrenheit** graduations

No.	A	B	C	D
Graduated to	100°	150°	200°	360°C
Graduated to	212°	300°	400°	600 F
Each	.85	1 00	1.20	1.40

C-5289 Thermometers—With enclosed milk-glass, double scale reading in **Centigrade** and **Fahrenheit.**

No.	A	B	C	D
Graduated to	100°	150°	200	360°C
Graduated to	212°	300°	400°	600 F
Each	2.00	2 20	2.50	2.75

We are prepared to furnish special shapes and ranges in mercurial thermometers as well as all kinds of optical and electrical pyrometers.

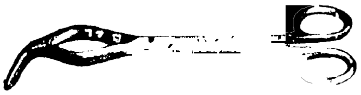
C-18145

C-18145 Tongs—Crucible—Brass, polished, single bent

No.	A	C
Length, mm	225	300
Each	.50	.80

C-18148 Tongs—Crucible—Same style as No **C-18145** above; nickel-plated

No.	A	C
Length, mm	225	300
Each	.70	1.30



C 18151

C-18151 Tongs — Crucible Brass, polished, double bent Same sizes and prices as No **C-18145** above

C-18153 Tongs—Crucible—Same style as No **C-18151** above, nickel-plated Same sizes and prices as No **C-18148** above

C-18165

C-18155 Tongs—Crucible—Of forged steel, nickel-plated; single bent

No.	A	B
Length, mm	225	300
Each	.60	.85

C-18160 Tongs—Crucible—Of forged steel, nickel-plated; double bent Same sizes and prices as No **C-18155** above

C-18165 Tongs—Crucible—Of nickel-chromium alloy; double bent, length, 225 mm
Each ....Net 3.75

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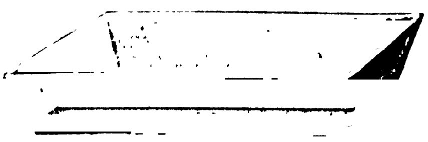


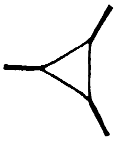
C-5345

C-5345 Trays—Photographic—Of white, pressed glass, for developing photographs and other purposes

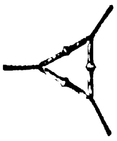
No.	A	B	C	D	E
Length, in	5½	6	8½	9	10½
Width, in	4	4	5½	7	8
Each	30	.30	.45	65	90

C-5350 Trays—Photographic Of colored glass for developing photographs and other purposes

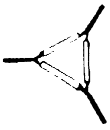
No.	A	B	C	D	E
Length, in	5½	6	8½	9	10½
Width, in	4	4	5½	7	8
Each	.30	30	.45	.65	90



C-18215



C-18225



C 18220

C-18215 Triangles—Twisted iron wire

No.	A	B	C
Size	Small	Medium	Large
Each	06	.06	.06
Per dozen	.60	.60	.60

C-18220 Triangles Iron wire, covered with pipe-stem.

No.	A	B	C
Size	Small	Medium	Large
Each	10	10	10
Per dozen	1 05	1 05	1 05

C-18225 Triangles—Iron wire, covered with pipe-stem, flanged so that the vessel rests on three points only, thus increasing the heating surface, saving time and gas

No.	A	B	C
Size	Small	Medium	Large
Each	.12	.12	12
Per dozen	1 20	1 20	1 20

C-18235 Triangles—"Nichrome"- Made from original alloy of nickel and chromium, are very hard, tough, and resist oxidation and attack of fumes, may be used wherever platinum triangles are suitable

No.	A	B	C	D
Length of side, mm	40	50	65	75
Diam inscribed circle, mm	22	29	36 5	44 5
Each	12	.12	15	.15

C-18240 Triangles — "Chromel" - Of square wire, with twisted ends

No.	A	B	C	D
Length of sides, in	1½	2	2½	3
Diameter of inscribed circle, in	7/8	$1\frac{5}{32}$	$1\frac{7}{16}$	$1\frac{3}{4}$
Each ....Net	.28	.28	.40	.40

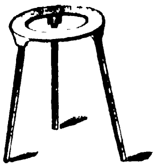
C-18245 Triangles—"Chromel"—Of round wire, with twisted ends

No.	A	B	C	D
Length of sides, in	1½	2	2½	3
Diameter of inscribed circle, in	7/8	$1\frac{5}{32}$	$1\frac{7}{16}$	$1\frac{3}{4}$
Each ..... Net	.18	.18	.25	.25

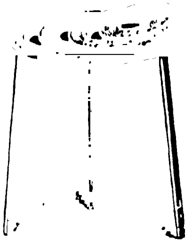
Triangles—"Vitreosil" Either solid or mounted on wire, withstand laboratory conditions indefinitely, outlast innumerable pipe stem triangles, and can be used at higher temperatures with much less loss of heat on account of their smaller conductivity no damage can result to platinum utensils supported by "vitreosil" triangles "Vitreosil" mounted "nichrome" triangles are especially recommended

	No.	A	B	C	D	E	F
	Length of side, mm	38	44	51	57	63	70
C-6195	On iron wire, each Net	.25	.25	.25	.33	.33	.42
C-6196	On nickel wire, each Net	.33	33	.33	.42	.50	.58
C-6197	On "nichrome" wire, each Net	50	50	50	.60	70	.80
C-6198	All silica, each Net	1 50	1 50	1 50	1 75	1 75	2 00

	No.	G	H	I	J
	Length of side, mm	76	82	89	95
C-6195	On iron wire, each Net	.42	50	.50	.58
C-6196	On nickel wire, each Net	.58	67	.67	.75
C-6197	On "nichrome" wire, each Net	.80	90	.90	1.00
C-6198	All silica, each . Net	2 00	2 00	2.25	2.25



C-18260



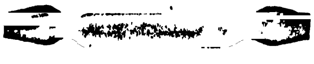
C-18265

C-18260 Tripods—Iron—For Bunsen burner, single ring

No.	A	B	C	D
Diameter, mm	70	100	125	150
Each	.40	.40	.40	.55
No.	E	F	G	
Diameter, mm	200	250	300	
Each	.85	1.10	1 25	

C-18265 Tripods—Iron For supporting water baths, sand baths, retorts, etc

No.	A	B	C	D	E
Diameter, mm	125	150	200	250	300
Number of rings	2	3	4	5	6
Each	65	.95	1.25	1.70	2 10



C-5365

C-5365 Tubes—Connecting—Straight, with both ends of same size

No.	A	B	C
Length, mm	65	70	75
Diameter, inside, mm	6	10	12
Each	.05	.05	.05

C-5370 Tubes—Connecting—Straight, with ends of different sizes Same lengths, diameters and prices as No C-5365 above

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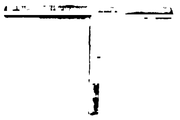
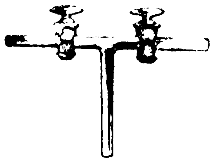
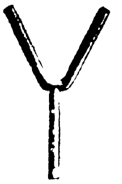


C 5375



C 5380



C 5300

C-5375 Tubes—Connecting Of glass, T-shape

No.	A	B	C	D	F
Diam, inside mm	3	5	6	9	12
Each	07	08	09	.11	.15

C-5380 Tubes—Connecting Of glass, T-shape, with two Geissler stopcocks, diameter, inside, 5 mm

Each . . 1.80

C-5390 Tubes—Connecting Of glass, Y shape

No.	A	B	C	D	F
Diam, inside, mm	3	5	6	9	12
Each	.08	09	.10	.12	.16

C-6210-15 Tubes—"Vitreosil"—Unglazed In lengths up to 10 feet Satin surface, superior heat and chemical resisting properties and exceptional resistance to sudden changes of temperature render "Vitreosil" tubes superior to glass, porcelain and platinum for use in combustion work, as pyrometer tubes, in electrical furnace construction, in gas reaction work, in flue gas analysis and as cooling elements, are supplied with ends fused smooth and to true circular shape, permitting gas tight closure with rubber stoppers, permit rapid heating, thus effecting a decided saving of time, and may be subjected to the highest temperatures in combustion work without danger of bending, largely employed in electric resistance furnaces for determination of carbon, oxygen and sulphur in iron, steel and other non-volatile metals, for determination of sulphur in pyrites cinder, and for determination of carbon, hydrogen, halogens and sulphur in organic compounds, admirably adapted for chemical operations involving reactions between gases at high temperature, or may be employed for reaction chambers in which the combination of gases evolving heat is brought about, can be supplied with extremely thin walls and form especially efficient units for the cooling and condensation of corrosive liquids and gases

No.	J	L	BB	C	D
Bore, mm	6 7	9 10	12 13	17 18	19
Wall thickness, mm	2 2.5	2 2.5	1 2	1 2.5	1 3
Per foot . Net	1.44	2.33	2.00	2.50	2.80
Extra per tube for closed end Net	.30	.35	.40	65	.75

No.	E	F	G	I	JJ
Bore, mm	22	25	28 29	35	38
Wall thickness, mm	1 3	1 3	2 4	2 5	2 5
Per foot Net	3.05	3.35	3.55	4.00	4.20
Extra per tube for closed end Net	.75	.85			

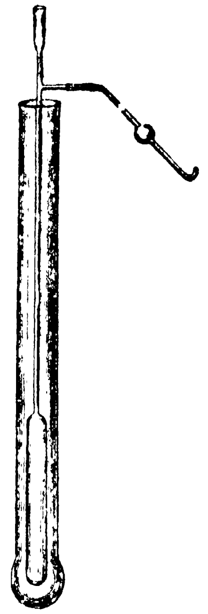
For length of less than 1 foot, add 10%

Many other sizes of bore and thicknesses of wall can be supplied Prices on request

C-18360 Tubing, Metal—Flexible—Made of continuous strip of grooved metal wound spirally over itself between layers, is especially practical from standpoint of safety and durability, of steel

No.	B	C	D	DD
Diameter, mm	6	6	6	6
Length, mm	600	750	900	1800
Per length	.25	.30	.35	.60

No.	F	G	H	I
Diameter, mm	8	8	8	8
Length, mm	600	750	900	1800
Per length	.30	.35	.40	.65



C-5430

C-5430 Vapor Density Apparatus — Victor Meyer's — Improved form complete

Each . . . 1.70

Inner Tube—Only for C-5430.

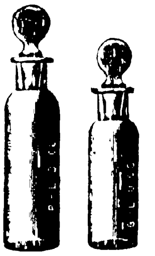
Each 85

Outer Tube—Only for C-5430.

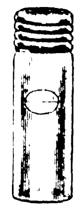
Each 85

Small Glass Stoppered Vials—Only for use with C-5430.

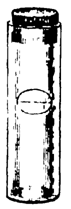
Each 27



C-5435



C-5445



C-5450

C-5435 Vials—With flat bottom, slight neck and ground-in, air-tight stopper, so-called "Specimen" vials

No.	AA	A
Capacity, cc	2	4
Each	.12	.12

C-5445 Vials Homeopathic, short form, with neck, flat bottom, and cork-lined metal screw-cap.

No.	A	B	C	D	E	G	I
Capacity, drams		1	2	3	4	8	12
Per gross		2.45	2.80	3.20	4.15	6.75	8.85

C-5450 Vials — Tube Form — So-called "Shell Vials", of clear, white glass, without constriction at neck, with flat bottom, without corks

No.	9	20	29	41
Height, mm	38	50	60	70
Diameter, mm	12	12	13	15
Per gross	1.10	1.10	1.20	1.45

No.	42	50	55
Height, mm	70	75	80
Diameter, mm	22	20	25
Per gross	2.40	2.30	3.40

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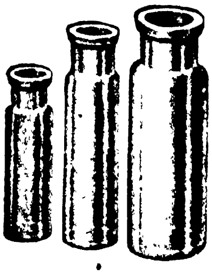


C-5460

C-5465

C-5460 **Vials** Homeopathic, short form, with neck, flat bottom for cork stopper

No.	C	D	F	H	I	J
Capacity, drams	½	1	2	4	6	8
Per gross	1 15	1 15	1 35	2 70	3 60	4 50

C-5465 **Vials**- Homeopathic, long form, with neck, flat bottom for cork stopper

No	C	D	F	H	I	J
Capacity, drams	½	1	2	4	6	8
Per gross	1 15	1 15	1 35	2 70	3 60	4 50

C-5470

C-5470 **Watch Glasses** -Of well-annealed glass, thin, concave, with edges smoothly ground

No.	C	D	E	F	G	H
Diameter, mm	40	50	65	75	85	100
Per ten .	40	.70	.80	.95	1 05	1 25

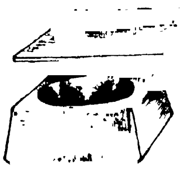
No.	I	J	L	N	O
Diameter, mm	115	125	150	175	200
Per ten..	1.40	1.55	1.65	2.75	3.40

C-5475 **Watch Glasses**—In pairs, with edges accurately ground together, not to be confused with counterposed watch glasses

No.	A	B
Diameter, mm .	50	65
Per pair	.30	.35

C-5480 **Watch Glasses—Balance**—Counterposed in pairs, accurately adjusted for interchangeable use on analytical balance pans

No.	B	BB	C
Diameter, mm . .	65	70	75
Per pair. ... .. . .Net	1.35	1.35	1.35



C-5490

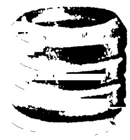
Prices subject to change without notice

C-5490 **Watch Glasses** Square form, consist of glass blocks, 40 mm square, with a concavity, one vertical surface ground for writing on, bottom of concavity fairly flat but with mold, or unpolished finish with cover

Per ten .	1.00

C-5495 **Watch Glasses** Square form same as No. C-5490 above but with polished, spherical cavity

Per ten .	4.25



C-5497

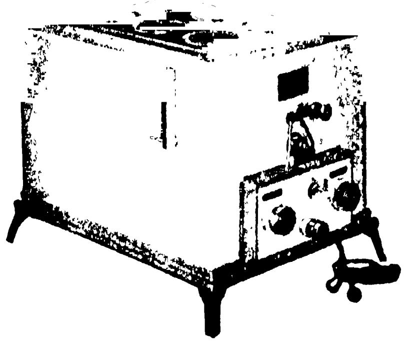
C-5497 **Watch Glasses--Syracuse Solid** Improved form, most convenient for handling without danger from dropping and will withstand more hard usage without breaking or chipping than any other form bottom surfaces are parallel, making it possible to examine objects in the glass without distortion, while the slight curvature around the inside of the bottom permits the easy use of the section lifter, flange around the bottom permits the glasses to be stocked securely

Per ten . . .	70

C-5498 **Watch Glasses — Syracuse Solid** -- Same as No **C-5497** above, but with ground, beveled surface for writing on

Per ten	.95

WATER BATHS



C-18923

C-18922 **Water Bath—Freas' Electric** Automatically controlled, consists of heavy copper tank with heavy asbestos outer covering, has working space 4 in deep by 12 in by 18 in , constant temperature regulator is the standard Freas bimetallic ; without cover, constant temperature range is from room temperature up to about 65°C.

Each .... .Net	150.00

(Please state voltage and current when ordering.)

C-18923 **Water Bath — Freas' Electric** --Similar to No C-18922, but with cover, temperature range is from room temperature up to about the boiling-point of water

Each ....Net	180.00

(Please state voltage and current when ordering.)

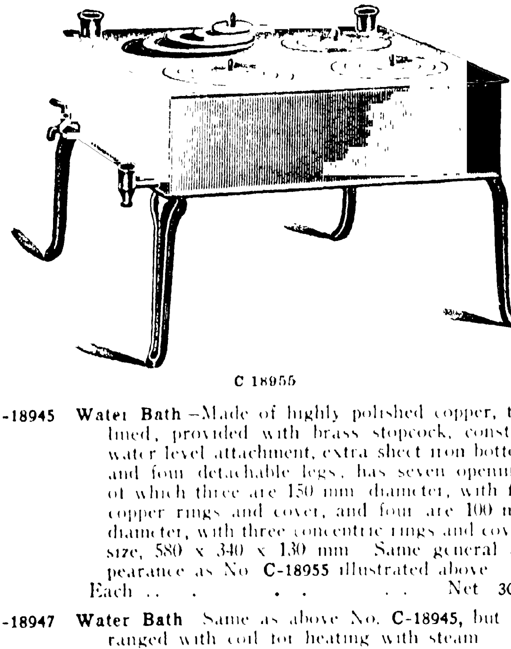
Continued on Next Page

C 18930

C-18930 Water Bath—Electric Constructed of heavy polished copper, tin lined and equipped with electric heating coil in water chamber, removable cover, provided with tubulation for thermometer, contains two sets (the large bath, four sets) of concentric rings, affording openings with range from 2.5 to 15 cm, removable copper tray rests inside of bath, supported by brackets, fitted with constant water level and brass faucet for drawing off water, supported on sheet iron base 15 cm high, furnished complete, ready to attach to a lamp socket

No.	A	B
Height, cm	13	13
Width, cm	38	38
Depth, cm	38	20
Each	Net 72 00	45 00

(Please state voltage and current when ordering.)



C 18955

C-18945 Water Bath—Made of highly polished copper, tin-lined, provided with brass stopcock, constant water level attachment, extra sheet iron bottom, and four detachable legs, has seven openings, of which three are 150 mm diameter, with five copper rings and cover, and four are 100 mm diameter, with three concentric rings and cover; size, 580 x 340 x 130 mm Same general appearance as No **C-18955** illustrated above
Each .. . . Net 30.00

C-18947 Water Bath Same as above No. **C-18945**, but arranged with coil for heating with steam
Each .. .. .Net 37.50

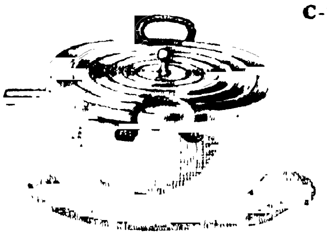
C-18950 Water Bath—Same as above No **C-18945**, but electrically heated
Each . ... .Net 90.00

C-18955 Water Bath—Same as No **C-18945**, but with four openings, each 125 mm diameter, size, 340 x 340 x 130 mm
Each .... Net 21.00

C-18960 Water Bath Same as No **C-18955**, but arranged with coil for heating with steam
Each . . . . Net 27.75

C-18965 Water Bath—Same as No **C-18955**, but electrically heated.
Each ....Net 67.50

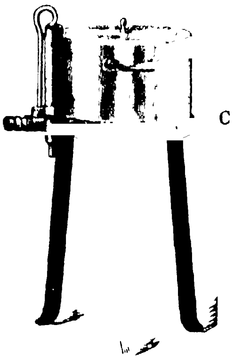
Prices subject to change without notice



C-18970

C-18970 Water Bath—Made of heavy copper, tin-lined, and provided with steam escape and set of concentric rings, hemispherical form

No.	A	B	C	D
Diameter, cm	10	13	14	15
Each	1 50	1.70	2 20	2.50
No.	**E**	**F**	**G**	
Diameter, cm	20	25	31	
Each	3 75	7.25	13.00	

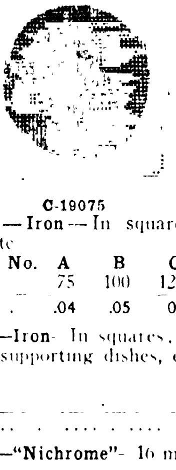


C-18995

C-18995 Water Bath—Tripod—Of polished copper, tin-lined, with concentric rings and water level regulator, diameter, 15 cm, depth, 10 cm, height of tripod, 23 cm
Each 8.75

C-19050 Wire—Copper.

No.	A	B	C	D	E	F
Gauge, B & S.	16	18	20	22	24	26
¼-lb spools, per spool.	.20	.20	20	20	.22	23
No.	**G**	**H**	**I**	**J**	**K**	
Gauge, B & S	28	30	32	34	36	
¼-lb spools, per spool	.30	.35	.42	.54	.85	



C-19075

C-19070 Wire Gauze—Iron—In squares; for supporting dishes, etc

No.	A	B	C	D	E	F
Size, mm	75	100	125	150	175	200
Each	.04	.05	08	.11	.15	.18

C-19075 Wire Gauze—Iron- In squares, with asbestos center, for supporting dishes, etc

No.	A	B	C
Size, mm	100	120	150
Each	.12	.15	.16

C-19080 Wire Gauze—"Nichrome"- 16 mesh of No 24 wire

No.	A	B	C
Size, in.	4 x 4	5 x 5	6 x 6
Each ... Net	.45	.65	.95
Per square foot ... Net			3.50

C-19085 Wire Gauze—Nichrome—20 mesh of No 27 wire

No.	A	B	C
Size, in.	4 x 4	5 x 5	6 x 6
Each ... Net	.60	.90	1.30
Per square foot ... Net			5.00

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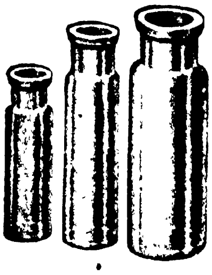


C-5460

C-5465

C-5460 Vials Homeopathic, short form, with neck, flat bottom for cork stopper

No.	C	D	F	H	I	J
Capacity, drams	[illegible]	1	2	4	6	8
Per gross	1 15	1 15	1 35	2 70	3 60	4 50

C-5465 Vials- Homeopathic, long form, with neck, flat bottom for cork stopper

No	C	D	F	H	I	J
Capacity, drams	[illegible]	1	2	4	6	8
Per gross	1 15	1 15	1 35	2 70	3 60	4 50

C-5470

C-5470 Watch Glasses -Of well-annealed glass, thin, concave, with edges smoothly ground

No.	C	D	E	F	G	H
Diameter, mm	40	50	65	75	85	100
Per ten .	40	.70	.80	.95	1 05	1 25

No.	I	J	L	N	O
Diameter, mm	115	125	150	175	200
Per ten..	1.40	1.55	1.65	2.75	3.40

C-5475 Watch Glasses--In pairs, with edges accurately ground together, not to be confused with counterpoised watch glasses

No.	A	B
Diameter, mm .	50	65
Per pair	.30	.35

C-5480 Watch Glasses—Balance—Counterpoised in pairs, accurately adjusted for interchangeable use on analytical balance pans

No.	B	BB	C
Diameter, mm . .	65	70	75
Per pair. ... .. . .Net	1.35	1.35	1.35

C-5490

Prices subject to change without notice

C-5490 Watch Glasses Square form, consist of glass blocks, 40 mm square, with a concavity, one vertical surface ground for writing on, bottom of concavity fairly flat but with mold, or unpolished finish with cover

Per ten . 1.00

C-5495 Watch Glasses Square form same as No C-5490 above but with polished, spherical cavity

Per ten . 4.25

C-5497

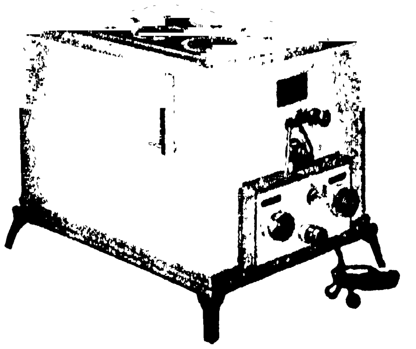
C-5497 Watch Glasses--Syracuse Solid Improved form, most convenient for handling without danger from dropping and will withstand more hard usage without breaking or chipping than any other form bottom surfaces are parallel, making it possible to examine objects in the glass without distortion, while the slight curvature around the inside of the bottom permits the easy use of the section lifter, flange around the bottom permits the glasses to be stocked securely

Per ten . . . 70

C-5498 Watch Glasses — Syracuse Solid -- Same as No **C-5497** above, but with ground, beveled surface for writing on

Per ten 95

WATER BATHS



C-18923

C-18922 Water Bath—Freas' Electric Automatically controlled, consists of heavy copper tank with heavy asbestos outer covering, has working space 4 in deep by 12 in by 18 in, constant temperature regulator is the standard Freas bimetallic; without cover, constant temperature range is from room temperature up to about 65°C.

Each .... .Net 150.00

(Please state voltage and current when ordering.)

C-18923 Water Bath — Freas' Electric --Similar to No C-18922, but with cover, temperature range is from room temperature up to about the boiling-point of water

Each ....Net 180.00

(Please state voltage and current when ordering.)

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		100 g	250 g	500 g
Ammonium Hydrate, C P	GSB	24	35	52
	GSB	4 lb bottles		1 30
Ammonium Hydrate, Pure	GSB	24	33	46
	GSB	4 lb bottles		1 28
Ammonium Hydrosulfide	GSB	24	35	52
Ammonium Molybdate, C P	CB	98	1 70	2 95
Ammonium Nitrate, C P	CB	32	50	80
Ammonium Nitrate Pure	CB	20	29	44
Ammonium Oxalate, C P	CB	40	66	1 10
Ammonium Oxalate, Pure	CB	37	58	98
Ammonium Persulfate C P	CB	43	68	1 15
Ammonium Phosphate, C P Secondary	CB	43	70	1 15
Ammonium Phosphate C P Primary	CB	47	78	1 30
Ammonium Sulfate C P	CB	27	35	55
Ammonium Tartrate C P	CB	51	83	1 40
Ammonium Potassium Tartrate, Pure	CB	25 g		25
Ammonium Thiocyanate, C P	CB	53	95	1 50
Amyl Acetate Pure	CB	63	88	1 50
Aniline Hydrochloride, C P, Cryst and Pure	CB	49	80	1 40
Aniline Oil C P	CB	38	61	1 00
Aniline Sulfate, C P, Cryst	CB	45	72	1 25
Antimony Metal	Cart	21	30	45
Antimony Pentachloride, C P	GSB	48	95	1 59
Antimony Pentoxide C P Pwd	CB	52	88	1 45
Antimony Trichloride C P	GSB	45	69	1 05
Antimony Trioxide, C P, Pwd	CB	23	36	62
Antimony Trisulfide, C P, Red (ous)	CB	72	1 24	2 15
Antimony Potassium Tartrate	CB	42	68	1 15
Arsenic Metal, Pure	CB	52	87	1 46
Arsenic Sulfide Yellow	CB	25	39	69
Arsenic Sulfide, Red	CB	31	49	75
Asbestos, Medium Fiber	Cart	65	1 12	1 90
Asbestos, Long Fiber, washed in acid and ignited	Cart	79	1 38	2 35
Ascarite	Per lb			4 50
Barium Acetate, C P	CB	40	64	1 05
Barium Carbonate, C P	CB	31	50	80
Barium Chloride, C P	CB	22	31	49
Barium Chloride Pure	Cart	20	25	30
Barium Dioxide, C P, Powd	CB	31	49	78
Barium Hydrate, C P, Cryst	CB	24	36	55
Barium Nitrate, C P	CB	27	43	67
Barium Nitrate, Tech	CB	20	29	43
Barium Sulfide, Pure Gray 60%	CB	24	36	55
Barium Sulfate, Pure for X ray	CB	20	25	30
Benzaldehyde, U S P	CB	57	96	1 66
Benzidine, C P, for Blood Test	CB	25 g		65
Benzoyl Chloride	GSB	68	1 14	1 95
Beta Naphthol, U S P	CB	44	72	1 20
Bismuth Carbonate, C P	CB	1 06	1 85	3 30
Bismuth Chloride, C P, Cryst	CB	1 06	1 85	3 30
Bismuth Hydrate, C P	CB	1 15	2 00	3 52
Bismuth Metal	Cart	85	1 42	2 35
Bismuth Nitrate, C P	GSB	87	1 45	2 40
Bismuth Oxide Hydrated	CB	1 10	1 95	3 45
Bismuth Oxide, C P	CB	1 06	1 85	3 30
Bismuth Oxychloride, C P, Powd	CB	1 06	1 85	3 30
Bismuth Subcarbonate, U S P	CB	76	1 35	2 95
Bismuth Subnitrate, C P, Pwd	CB	1 06	1 85	3 30
Bone Charcoal, Powd	Cart	31	49	74
Borax Glass, Powd	Cart	27	41	65
Borax, U S P	Cart	....	.	27
Bromine, C P	GSB	40	66	1 35
Cadmium Bromide, C P, Cryst	CB	82	1 40	2 45
Cadmium Chloride, C P, Cryst	CB	82	1 40	2 45
Cadmium Iodide, C P, Cryst	CB	1 85	3 30	5 90
Cadmium Metal, Mossy	Cart	65	1 12	1 90
Cadmium Metal, Sticks	Cart	55	92	1 55
Cadmium Metal, Granular	Cart	65	1 12	1 90
Cadmium Nitrate, C P, Cryst	CB	75	1 30	2 30
Cadmium Sulfate, C P, Cryst	CB	75	1 30	2 28
Caffeine, U S P	Cart	3 40	5 40	8 40
Calcium Acetate, Pure Dried	CB	24	37	65
Calcium Carbonate, C P	CB	35	56	94
Calcium Carbide, Lumps	Can			30
Calcium Chloride, C P, Anhyd Sticks	CB.	37	60	1 00
Calcium Chloride, Tech. (for Desiccators)	Can	....	.19	.29

		100 g	250 g	500 g
Write for quotation in 130 lb drums				
Calcium Chloride, C P, Gran	CB	17	22	32
Calcium Fluoride, Pure	CB	21	30	46
Calcium Metal	Can	25 g		1 80
Calcium Oxalate, C P	CB	50	82	1 40
Calcium Oxide (from Marble)	CB	17	22	32
Calcium Phosphate Pure, Primary	CB	24	37	65
Calcium Phosphate C P, Secondary	CB	40	64	1 08
Calcium Phosphate, C P Tertiary	CB	40	64	1 08
Calcium Sulfate, C P	CB	23	40	53
Calcium Sulfate, Pure, Precip	CB	21	39	50
Calcium Sulfide, Pure	CB	32	50	80
Carbon Bisulfide C P	CB	24	34	54
Carbon Bisulfide Tech	CB	13	18	29
Carbon Tetrachloride, C P	CB	27	41	66
Cerium Nitrate	GSB			2 45
Cerium Oxalate, U S P	CB	35	53	87
Charcoal, Bone, Granular	CB	25	37	58
Charcoal, Bone, Powd	CB	32	50	81
Charcoal, Blood, C P	CB	57	96	1 65
Chloroform, U S P	CB	26	44	77
Chromium Chloride C P, Dry	CB	79	1 35	2 35
Chromium Nitrate, C P, 40%	GSB	47	71	1 12
Chromium Sulfate C P, 30%	GSB	36	52	71
Cobalt Chloride, Pure	GSB	25 g		32
Cobalt Nitrate, C P, Cryst	CB	77	1 32	2 30
Cobalt Oxide, C P, Powd	CB	1 35	2 40	4 25
Collodion, U S P	CB	25	37	56
Copper Turnings	Cart	17	23	30
Copper, Electrolytic, Sheet, 0 008"	Paper	..	....	1 05
Copper, Electrolytic, Foil, 0 002"	Paper	.	.	1 63
Copper Acetate, C P, Cryst	CB	45	72	1 22
Copper Acetate, Pure Basic, Powd	CB	34	48	80
Copper Ammonium Chloride, C P, Cryst	CB	30	46	73
Copper Carbonate, Precip	Cart	24	36	55
Copper (ic) Carbonate, C P, Basic	CB	45	72	1 22
Copper (ic) Chloride, C P, Cryst	CB	30	46	75
Copper (ous) Chloride, C P, Cryst	CB	47	76	1 30
Copper (ic) Nitrate, C P, Cryst	CB	31	49	78
Copper (ic) Oxide, C P, Black Powd	CB	43	68	1 15
Copper (ous) Oxide, C P, Red Powd	CB	48	95	1 60
Copper Sulfate, C P, Cryst	CB	26	39	61
Copper Sulfate, Pure, Cryst	CB	18	25	40
Copper Sulfate, C P, Anhyd, Powd	CB	38	62	1 00
Copper Sulfide, Precip	CB	48	91	1 55
Cresol, U S P	CB	20	26	43
Dextrin, White Powd, N F.	Cart	..	.	20
Dextrose, C P, Powd	CB	83	1 41	2 50
Dimethylglyoxime	CB	25 g	.	1 65
Diphenylamine, Tech	CB	50	89	1 50
Ether, U S P	Can	20	30	37
Ether, C P (distilled over sodium)	Can	41	68	1 21
Ether, Acetic, U S P	CB	25	37	55
Ether, Nitrous, Conc 1-21	CB	46	71	1 42
Ether, Petroleum, Spec, B P. 25°-140°C	Can	32	50	88
Ferric Chloride C P, Lumps	CB	23	34	53
Ferric Chloride, Pure	CB	23	34	41
Ferric Oxide, C P.	CB	35	54	90
Ferrous-Ammonium Sulfate, C P, Cryst	CB	26	38	61
Ferrous Chloride, C P, Dry	CB	34	.54	90
Ferrous Sulfate, C P, Powd Anhyd	CB	31	.48	78
Ferrous Sulfide, Sticks	Cart	15	16	23
Write for quotation in larger quantities				
Ferrous Sulfide, Lumps	Cart	16	17	21
Fluorspar	Cart	10	.11	.20
Formaldehyde, U S P, 36-40%	CB	23	.30	38
Fusel Oil	CB	44	63	1 00
Glycerine	CB.	.21	.32	.45

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		100 g	250 g	500 g
Gold Chloride, Cryst, Brown	CB	25 g	.	13 50
Gold-Sodium Chloride, Photo	CB	25 g	.	6 50
Gold-Sodium Chloride, U S P	CB	25 g		8 00
Hexamethylenetetramine	Cart	50	88	1 33
Hydrogen Peroxide, 3%, U S P	CB			25
Hydroquinone	Cart	69	1 12	2 17
Hydroxylamine Hydrochloride, Cryst	CB	5 90	10 00	18 00
Indigo Carmine, U S P, Dry	CB	1 20	2 10	3 75
Iodine Resublimed, U S P	GSB	1 43	2 70	5 26
Iron Powder	Cart	25	37	55
Iron Filings, Free from Grease	Cart			20
Iron Ferrocyanide Sol	CB	50	80	1 25
Lactose (Milk Sugar), U S P, Powd	Cart	21	34	47
Lead Acetate, C P, Basic, Dry Powd	CB	35	54	90
Lead Acetate, C P, Cryst	CB	28	43	70
Lead Carbonate, C P, Basic, Powd	CB	33	51	84
Lead Chloride, Pure	CB	41	70	1 25
Lead Metal, Gran Ag Free (Test lead)	CB	24	36	55
Lead Metal, Shot	Cart			20
Lead Metal, Coarl, Mossy	Cart	22	35	50
Lead Nitrate, C P, Cryst	CB	27	40	64
Lead Oxide, C P (Litharge)	CB	22	32	47
Lead Oxide, Brown, Pure	CB	46	72	1 15
Lead Oxide, C P (Red Lead)	CB	26	39	59
Lead Peroxide, C P, Powd	CB	33	51	82
Lead Sulfate, Pure	CB	47	64	85
Lithium Nitrate, C P, Cryst	CB	1 00	1 75	3 05
Lithium Carbonate, C P, Powd	CB	94	1 65	2 90
Lithium Sulfate, C P, Cryst	CB	84	1 45	2 55
Litmus Cubes	Cart	55	90	1 50
Magnesium Carbonate, C P, Basic	CB	40	64	1 05
Magnesium Carbonate, Powd, U S P	Cart	23	34	42
Magnesium Chloride, C P, Cryst	CB	23	33	52
Magnesium Metal, Powd	Tins	1 15	2 05	3 35
Magnesium Metal, Ribbon	1 oz rolls			65
Magnesium Nitrate, C P, Cryst	CB	30	46	76
Magnesium Oxide, C P, Powd	CB	66	1 10	1 90
Magnesium Oxide, U S P, Heavy	Cart	40	57	1 10
Magnesium Sulfate, C P, Cryst	CB	21	30	46
Manganese Carbonate, C P, Powd	CB	38	61	1 00
Manganese Chloride, C P	CB	34	53	88
Manganese Dioxide, C P	CB	33	51	82
Manganese Dioxide, Gran	Cart			25
Manganese Sulfate, C P, Cryst Fine	CB	34	53	88
Marble Chips	Cart			15
Mercury, C P, Redistilled	Jug	1 00	1 80	3 00
Mercuric Acetate, C P	CB	1 00	1 75	3 10
Mercuric Bromide, C P, Cryst	CB	25 g		60
Mercuric Chloride, C P, Powd	CB	56	94	1 60
Mercuric Iodide, C P, Powd	CB	1 52	2 68	4 80
Mercuric Nitrate, C P, Cryst	GSB	73	1 18	1 95
Mercuric Oxide, Red, C P	CB	79	1 32	2 30
Mercuric Oxide, Pure Powd, U S P	Cart	50	83	1 46
Mercuric Oxide, C P, Yellow Powd.	CB	90	1 52	2 70
Mercurous Chloride, C P, Powd	CB	55	94	1 64
Mercurous Nitrate, C P, Cryst	GSB	75	1 25	2 30
Mercurous Nitrate, C P, Powd.	CB	1 01	1 75	3 05
Mercury Oxide, Black (ous)	CB	25 g		27
Mercury Sulfide, Red	CB	1 00	1 75	3 10
Methyl Iodide, C P, Liquid	GSB.	25 g	.	1 35
Methylene Blue, U.S P.	CB	2 12	3 80	6 98
Naphthol, Alpha-, C P, Cryst	CB.	1 12	1 95	3 40
Naphthol, Beta-, Resublimed	CB	44	72	1 20
Naphthylamine, Alpha-, Cryst.	CB.	69	1 19	2 05
Naphthylamine, Beta-, Cryst	CB.	1.07	1 80	3 30
Nickel Acetate, C P. (ous)	CB.	56	94	1 62
Nickel Carbonate, C P, Powd.	CB.	.63	1 05	1 82
Nickel Chloride, C P, Cryst. (ous)	CB.	.52	.86	1 48
Nickel Oxide, Black, C P, Powd	CB	86	1 48	2 60
Nickel Metal, Shot	CB	32	50	85
Nickel Nitrate, C P	CB	48	80	1 35
Nickel Sulfate, C P, Cryst	CB	45	73	1 22
Nickel Ammonium Sulfate, C P, Cryst	CB	30	46	75
Nitrobenzene (Mono)	CB	30	37	50
Paper, Litmus	100 Strips per tube, each			10
Paraldehyde, U S P	CB	41	70	1 26
Phosphoric Anhydride Powd	GSB	51	80	1 25
Phosphorus Oxychloride	GSB	53	90	1 60
Phosphorus Pentachloride	GSB	37	60	1 10
Phosphorus Red, Powd	CB	44	72	1 20
Phosphorus Trichloride	GSB	40	64	1 25
Phosphorus, Yellow, Sticks	CB	32	50	80
Platinum Chloride, Cryst	GSB	25 g	.	37 00
Potassium Ammonium Sulfate, C P, Cryst	CB	34	54	86
Potassium Antimonate, C P, Powd	CB	1 10	1 95	3 40
Potassium Bicarbonate, C P	CB	31	48	78
Potassium Bicarbonate, U S P, Cryst	Cart	23	34	40
Potassium Bichromate, C P	CB	33	51	83
Potassium Bichromate, Pure, Cryst	Cart	23	34	40
Potassium Binoxalate, Cryst	CB	40	64	85
Potassium Bisulfate, C P, Cryst	CB	36	67	94
Potassium Bisulfate, C P, Fused (Pyro)	CB	38	61	1 00
Potassium Bromate, C P	CB	52	86	1 48
Potassium Bromide, U S P, Gran	CB	21	35	47
Potassium Bromide, C P	CB	31	48	78
Potassium Carbonate, C P, Cryst	CB	28	43	70
Potassium Carbonate, U S P, Powd	CB	23	34	40
Potassium Chlorate, C P	CB	27	41	66
Potassium Chlorate, U S P, Gran	Cart	23	35	43
Potassium Chloride, C P	CB	30	46	76
Potassium Chloride, Pure, Cryst	CB	21	33	42
Potassium Chloride, Pure	CB	21	33	42
Potassium Chloroplatinate	CB	1 g		2 50
Potassium Chromate, C P	CB	49	80	1 38
Potassium Chromate, Pure	CB	27	42	70
Potassium Cyanide, C P, Lumps	CB	66	1 10	1 95
Potassium Cyanide, Tech	CB	32	45	63
Potassium Ferrocyanide, C P	CB	47	76	1 30
Potassium Ferrocyanide, Pure, Cryst	CB	47	72	1 15
Potassium Ferricyanide, C P	CB	53	88	1 50
Potassium Fluoride, Pure	CB	1 00	1 80	3 10
Potassium Formate, Pure	CB	60	1 10	1 75
Potassium Hydroxide, C P, Sticks	CB	34	54	90
Potassium Iodate, C P	CB	25 g		70
Potassium Iodide, C P	CB	1 10	1 90	3 40
Potassium, Metal	GSB	25 g		1 50
Potassium Nitrate, C P, Cryst	CB	33	51	85
Potassium Nitrite, Purified, Sticks	CB	54	90	1 55
Potassium Oxalate, Neutral, C P, Cryst	CB	51	84	1 45
Potassium Perchlorate, C P, Cryst	CB	38	61	1 00
Potassium Permanganate, C P, Cryst	CB	49	81	1 38
Potassium Phosphate, Secondary, C P, Cryst	CB	54	90	1 55
Potassium Phosphate Primary, C P, Cryst	CB	52	87	1 50
Potassium Phosphate, C P, Tertiary, Cryst	CB	58	97	1 68
Potassium Sulfate, C P, Cryst.	CB	32	40	82
Potassium Sulfite, C P, Cryst	CB	54	90	1 55
Potassium Tartrate, CP, Cryst	CB	50	83	1 41
Potassium Tetraoxalate, C P	CB.	62	1 02	1 80
Potassium Thiocyanate, C P.	CB.	65	1 00	1 95
Potassium-Sodium Tartrate, U S P., Powd.	Cart.	.23	30	.35

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		100 g	250 g	500 g
Pyrogallol	CB	94	1.65	2.91
Pyroxylin, in Strips, Purified	GSB	25 g		1.00
Resorcin, U S P, Cryst	CB	95	1.75	3.10
Silver Chloride, C P, Powd	CB	25 g		1.30
Silver Lactate, Pure	CB	25 g		1.00
Silver Metal, Precipitated	CB	25 g		1.40
Silver Nitrate, C P, Cryst	CB	2.98	5.35	9.70
Soda Lime, Wilson Non Hydroscopic Absorbs 100% more CO_2 than ordinary soda lime Special quantity price 8-14 mesh dry or 10% H_2O)	CB	25	37	60
Sodium Acetate, C P, Cryst	CB	24	34	55
Sodium Ammonium Phosphate, C P, Cryst	CB	32	50	80
Sodium Arsenate, C P, Cryst	CB	33	51	85
Sodium Arsenite, C P, Powd	CB	34	54	87
Sodium Benzoate, U S P	CB	44	63	1.00
Sodium Bicarbonate, C P	CB	21	30	46
Sodium Bicarbonate, Tech, Powd	CB			17
Sodium Bichromate, C P	CB	27	42	67
Sodium Bismuthate C P	CB	1.87	3.32	6.00
Sodium Bisulfate, C P, Cryst	CB	24	35	55
Sodium Bisulfate, Meta, Pwd	CB	32	45	65
Sodium Bisulfite, Pure, Dry	CB	23	34	40
Sodium Borate, C P, Cryst	CB	25	37	60
Sodium Bromate, C P, Cryst	CB	56	94	1.60
Sodium Bromide, C P, Cryst	CB	31	47	75
Sodium Carbonate, C P, Cryst	CB	21	30	46
Sodium Carbonate, C P, Anhyd, Powd	CB	25	37	58
Sodium Carbonate, U S P Monohydrate	CB			25
Sodium Chromate, C P, Cryst	CB	38	61	1.00
Sodium Chloride, C P, Cryst	CB	33	51	85
Sodium Citrate, C P, Cryst	CB	53	87	1.50
Sodium-Cobalt Nitrate, C P, Powd	CB	25 g		68
Sodium Cyanide, C P, Gran	CB	36	56	95
Sodium Cyanide, Fused	CB	30	46	65
Sodium Formate, C P, Cryst	CB	58	97	1.68
Sodium Fluoride, Tech	CB			34
Sodium Hydrate, C P, Sticks by Alcohol	CB	27	41	66
Sodium Hydrate, U S P, Sticks	CB	21	30	45
Sodium Hydroxide, Tech, Gran	Can			22
Sodium Hyposulfite, Cryst	Cart		. .	29
Sodium Iodate, C P	CB	25 g		84
Sodium Iodide, C P	CB	1.55	2.75	4.90
Sodium, Metal	Can	44	72	1.21
Sodium Nitrate, C P, Cryst	CB	27	35	55
Sodium Nitrite, C P, Sticks	CB	28	43	73
Sodium Nitroprusside, C P	CB	25 g		70
Sodium Oxalate, C P, Powd	CB	37	57	96
Sodium Perborate, U S P	Cart	31	48	77
Sodium Peroxide, C P	Can	33	51	82
Sodium Phosphate, C P, Primary, Cryst	CB	35	56	94
Sodium Phosphate, C P, Secondary, Cryst	CB	24	34	55
Sodium Phosphate, C P, Tertiary, Cryst	CB	42	65	1.10
Sodium Pyrophosphate, C P, Cryst	CB	36	57	96
Sodium Silicate, 40°, Liquid	CB	. .	. . . .	28
Sodium Sulfate, C P, Anhyd, Powd	CB	50	83	1.40
Sodium Sulfate, U S P, Cryst	CB	17	26	35
Sodium Sulfide, C P, Cryst	GSB	42	61	95
Sodium Sulfite, C P, Cryst	CB	21	30	45
Sodium Sulfite, C P, Anhyd	CB	26	40	64
Sodium Tartrate, C P, Cryst	CB	38	62	1.02
Sodium Thiocyanate, Pure	CB	31	50	85
Sodium Thiosulfate, C P.	CB	20	29	43
Sodium Tungstate, C P	CB	71	1.20	2.10
Stannic Chloride, C P, Cryst	GSB	49	75	1.18
Stannous Chloride, C P, Cryst	CB	41	65	1.10
Starch Iodide, Powd	CB	25 g		31
Starch, Potato	CB	19	28	55
Starch, Soluble, Lintner	CB	55	92	1.60
Strontium Bromide, U S P	CB	20	43	68
Strontium Carbonate, C P	CB	38	62	1.00
Strontium Chloride, C P	CB	30	47	65
Strontium Nitrate, C P, Cryst	CB	35	54	.90
Strontium Sulfate, Pure	CB.	43	68	1.10

		100 g	250 g.	500 g
Sucrose, C P, Cryst	CB	36	58	95
Sulfur, Broken Lumps	Cart		. .	15
Sulfur Chloride	GSB	34	47	59
Sulfur, Precipitated	Cart	25	30	40
Titanium Tetrachloride, Liquid	CB	. .	.	1.70
Titanium Trichloride 20% Sol	GSB	.		5.00
Write for quantity price				
Toluene, C P	CB	26	39	61
Uranium Acetate, C P	CB	25 g		89
Uranium Nitrate, C P	GSB	25 g		60
Urea, Pure, Cryst	CB	85	1.25	2.10
Wax, Carnauba	Cart	34	55	92
Wax, Ceresin, White	Cart	25	37	60
Xylene, C P	CB	24	35	56
Zinc Chloride, C P, Gran	CB	27	42	67
Zinc Metal, 20 mesh	Cart	26	38	60
Zinc Metal, Sticks, As-free	Cart	32	48	77
Zinc Metal, Powd	Cart	25	30	38
Zinc Oxide, C P, Dry Process	CB	25	37	60
Zinc Sulfate, C P, Cryst	CB	26	39	62

INDICATORS

	10 g	25 g
Alizarin	0.90	2.00
Alpha Naphtholbenzol	40	80
Alpha-Naphthylamine	50	1.00
Azolitmin, range about 6.8	2.00	3.75
Benzopurpurine	50	1.00
Brilliant Green	75	1.50
Bromocresol Purple, 5.2-6.8 Per 1/10 g, 25c		
Bromophenol Blue, 2.8-4.5 Per 1/10 g, 25c		
Bromothymol Blue, 6.0-7.6 Per 1/10 g, 25c		
Carmine	9.10	19.25
Carminic Acid	2.00	5.00
O-Carboxybenzeneazodimethylaniline, range 4.4-6.0 Per 1/10 g, 25c		
O-Cresolsulfonephthalein, 7.2-8.8 Per 1/10 g, 25c		
Cochineal	40	80
Congo Red	25	50
Coralline	50	1.00
Cresol Blue, range 7.2-8.8 Per 1/10 g, 25c		
Dibromocresolsulfonephthalein, 5.2-6.2 Per 1/10 g, 25c		
Dibromocresolsulfonephthalein, 6.0-7.6 Per 1/10 g, 25c		
Dimethylaminoazobenzene, range 2.9-4.0	50	1.10
Dimethylaminoazobenzaldehyde	6.50	15.00
Dimethylglyoxime	1.50	3.00
Diphenylamine	30	50
Diphenylaminazobenzene, range 1.2-2.1	1.50	3.10
Eosine	75	1.60
Ethyl Orange	1.00	2.25
Fluorescein	75	1.50
Fuchsine, Acid	70	1.40
Fuchsine, Basic	55	1.10
Hematoxylin, C P	2.25	5.00
Iodoeosin	1.20	2.45
Lacmoid	1.00	2.25
Litmus (purified powd)	60	1.20
M-Dinitrobenzoylene Urea, 6-8 Per g, 85c		
Methyl Orange, range 3.1-4.4	50	1.00
Methyl Red, range 4.4-6.0	1.00	2.20
Methyl Violet, range 0.1-3.2	60	1.20
Neutral Red, range 6.8-8.0	75	1.60
Para-Nitrophenol, range 5.0-7.0	40	80
Phenacetolin	1.00	2.20
Phenolphthalein, range 8.3-10.0	25	50
Phenol Red, range 6.8-8.4 Per 1/10 g, 25c		
Phenolsulfonephthalein, 6.8-8.4 Per 1/10 g, 25c		
Phenylhydrazine	75	1.50
Phenylhydrazine Hydrochloride	50	1.00
Porrier's Blue	90	1.80
Rosolic Acid, range 6.9-8.0	50	1.00
Sodium Nitroprusside	.40	.75
Tetrabromophenolsulfonephthalein, range 2.8-4.5 Per 1/10 g, 25c		
Thymol Blue (acid), 1.2-3.0 Per 1/10 g, 25c		
Thymol Blue (alkaline), range 8.0-9.6 Per 1/10 g, 25c.		
Thymolphthalein, range 9.3-10.5	5.00	
Thymolsulfonephthalein (acid), range 1.2-3.0. Per 1/10 g, 25c		
Thymolsulfonephthalein (alkaline), range 8.0-9.6 Per 1/10 g, 25c		
Toluylene Red	.75	1.60
Tropaeolin 0, range 11.1-12.7	60	1.30
Tropaeolin 00, range 1.4-2.6	50	1.00
Tropaeolin 000, range 7.6-8.9	50	1.00

WILSON WELDER & METALS COMPANY

Incorporated

249 36th STREET, BROOKLYN, N. Y.

WILSON **Plastic-Arc** SYSTEM

(Trade Mark)

PRODUCTS AND SERVICE

Wilson Plastic-Arc Welder and Plastic-Arc certified welding metals.

Welding of every description done by the Wilson Plastic-Arc welding system.

WILSON PLASTIC-ARC WELDING SYSTEM

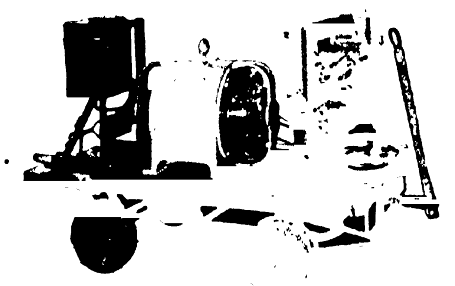
This system employs a flat compound wound 37½ volt, direct current generator, in connection with a panel containing an automatic control mechanism. This combination gives 18 to 22 volts at the arc, the rest of the power being used in the line and in the automatic power regulation. The advantage of the low voltage is that it prohibits the operator from making a long arc between the electrode and the work, which slags the metal deposit. If the arc is lengthened it is weakened and must be brought back to a proper distance to make the weld, this limiting the operator. Low voltage insures better penetration of the original metal by the concentrated arc than with a longer diffused arc of higher voltage.

Proper welding is accomplished by fusing the parent and new metal with a uniform welding heat. The heat is kept constant by the Wilson automatic mechanism mounted on the panelboard, an exclusive feature of the Plastic-Arc System.

All units are equipped with Plastic-Arc Automatic Regulating Panel (with improved indestructible, fool proof copper carbon resistor plates) insuring **Constant Heat Per Unit Area in the Weld.** This automatic control panel of the Wilson Plastic-Arc System is to welding what the Pyrometer is to the heat treatment of metals—it eliminates guesswork.

Plastic-Arc outfits are built in one, two and four-arc units, and four operators can draw energy from the same generator, each using a different heat as required on different metals without interference. A separate panel is required for each operator. The Plastic-Arc will weld practically any metal: cast, malleable and wrought iron, cast and rolled steel, bronze and brass, etc.

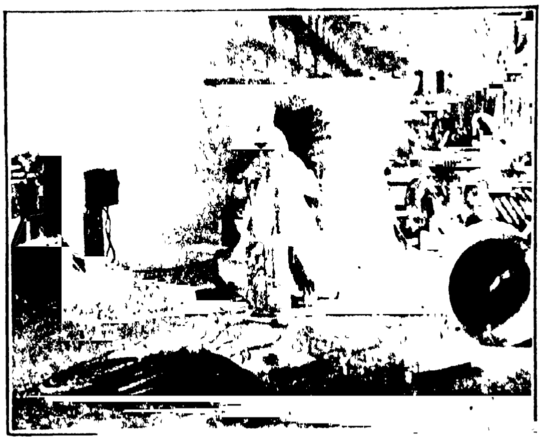
Damage on 20 German vessels, consisting of 118 major breaks which would have necessitated the renewal of 70 cast iron cylinders, some as large as 9 ft. in diameter, were repaired with the Plastic-Arc system. The saving to the United States Government amounted to $20,000,000.00 and twelve months of time, during which time ships transported over 500,000 troops overseas.



STANDARD PORTABLE ONE ARC WITH KB PANEL

One and Two Arc Stationary or Portable. Four Arc Stationary.

Standard Motor characteristics are 115, 230, 440, 550 volts D C ; 220, 440, 550 volts 60 cy 2 or 3 phase A. C. Other motor current furnished on specification.



CAST IRON CENTRIFUGAL DRYER BASE WELDED BY PLASTIC ARC SYSTEM

Weight 8500 lbs., crack 6 ft long, 1¼ in thick

PLASTIC-ARC CERTIFIED WELDING METALS

There are 8 grades of Plastic-Arc Certified Welding Metals and each can be depended upon, being guaranteed to give satisfactory results when employed upon the type of work it is designed for. These welding metals will give good results with any electric welding system.

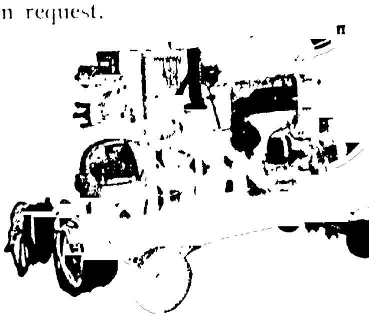
For machineable cast iron welds, without studs, specify Plastic-Arc Certified Welding Metal grade No 12, furnished in 14″ lengths and packed in 5-lb. container which affords full protection and eliminates waste. Special bulletin on welding metals supplied upon request.

COMMERCIAL WELDING

This company solicits commercial welding of any description.

BULLETINS

Wilson Plastic-Arc system and its uses are fully described in bulletins, copies of which will be supplied on request.



STANDARD 2 ARC GASOLINE ENGINE DRIVEN UNIT WITH KA PANELS

Also furnished in one arc capacity

THE WINNER COMPANY

30 CHURCH STREET, NEW YORK, N. Y.

DISTRIBUTORS

Buffalo, N Y Cyclone Grate Bar Co 9 Grimes Street
Chicago Ill L S Shaw & Co [illegible] W Jackson Boulevard
Cleveland O L S Shaw & Co 5616 Euclid Avenue
Columbus O L S Shaw & Co Comstock Building
Detroit, Mich L S Shaw & Co 6282 Dearborn Street
Grand Rapids Mich L S Shaw & Co Grand Rapids Savings Bank
Indianapolis Ind L S Shaw & Co Merchants Bank Building
New Orleans La J H Rockwell 712 Povdras Street
Pittsburgh Pa L S Shaw & Co, Bessemer Building
Springfield Mass F D Shaw 130 Firglade Avenue
Toledo O, L S Shaw & Co, Spitzer Building

PRODUCTS

Winner Steam Traps.
Winner Temperature Regulators.
Winner Boiler Compound.

WINNER STEAM TRAP

Adaptability—The Winner Steam Trap is adaptable to all purposes and all apparatus requiring removal of condensation with dispatch and economy, will remove condensation as fast as it flows to the trap whether in small quantity or heavy flow, up to its capacity, providing the inlet pressure is sufficiently great to overcome the outlet pressure or head that it may have to operate against.

THE WINNER STEAM TRAP

Construction—Rugged, fitting it for constant heavy duty. The valves are made of special Steam Metal, the Discs of Special Metal and Seats of Monel Metal, making them the best possible combination to stand the wear incidental to all traps. The Valve Disc is made with a deflector preventing the water from striking the walls of the valve and wearing through.

Repairs—Can be repaired as easily as an ordinary Globe Valve.

Operation—The Winner Steam Trap disposes of water or condensation automatically without waste of steam, responding to the slightest change of temperature; a change of one degree will cause it to operate at the proper time. There is no hesitation; it acts instantly and keeps all steam lines and other apparatus connected with it clear of condensation at all times, thereby proving the efficiency of the apparatus. It is always ready, impossible to become air-bound—the valve is always open until dry steam fills the body or expansion tubes of the Trap, therefore all cold water and air must pass out before Trap will close. This feature alone eliminates the necessity of by-pass valves, air-valves or other means of relieving the apparatus to obtain quick circulation. Does not require an elaborate layout or great space, taking up very little more space than the pipe that it is connected to. The Trap is provided with a test-cock on its valve body so an inspection can be made at any time to see that it is operating properly and not blowing through.

This Trap is the result of years of experience and experimental trials of a practical Engineer who has made Steam Traps a lifelong study and merits of same have been proven after years of thorough practical tests. It is being used with very satisfactory results in Power Plants, Laundries, Steamships and practically every imaginable kind of manufacturing, working exceptionally well on jacketed kettles for boiling, also on vulcanizing equipment, working both on high or low pressure, also on hot water.

Stock—The Winner Steam Traps are for general use on high and low pressure steam and are built in sizes from ½" pipe connections up; stock sizes ½" to 2", larger sizes built special. Prices on request.

WINNER TEMPERATURE REGULATOR

This Temperature Regulator operates on expansion and contraction caused due to change of temperature and is working very satisfactorily on Hot-Water Heaters, Condensers and in fact under practically all conditions where the temperature must be controlled so as not to go above or below a certain degree

WINNER BOILER COMPOUND

Formation of scale in boilers, also pitting and corrosion is a matter of vital importance, it not only being dangerous but is also expensive from the point that the boiler is not producing the efficiency that is expected and is the subject of innumerable articles in Scientific and Trade Journals throughout the country, and manufacturers and steam users cannot give it too much consideration

Winner Boiler Compound is an eradicator and preventive of scale formation in boilers. It removes and prevents incrustation and corrosion in steam boilers. Contains nothing that is injurious to the iron, brass or packing; acts by dissolving scale and other precipitated solids contained in the water, into a soft sludge which can readily be blown off.

If directions are followed it will remove old scale and prevent formation of new scale, as its action tends to coat the interior of the boiler after old scale had been removed and also holds any foreign matter that may be in the water in solution.

Winner Boiler Compound is a liquid and we recommend about one gallon to every 1,000 H.P. every twenty-four hours as sufficient to produce satisfactory results.

If your boilers are scaled, corroded or pitted advise us your conditions and we will be glad to send trial package on approval.

The policy of this company is to satisfy our customers and we are perfectly willing at all times to place our goods in on trial subject to approval.

Consult any of above Distributors regarding the Trap or Regulator or advise us direct your conditions.

The Distributors are not handling the Boiler Compound.

WINSLOW & COMPANY, INC.

Clay Products

PORTLAND, ME.

PRODUCTS

Vitrified Drainer Brick and Special Clay Products for the Chemical Industries.

Vitrified Clay Specialties for Pulp and Paper Mills, Acid Manufacturers, Fertilizer Plants, Explosive Plants, etc.

Sectional Conduit for Underground Pipe Covering.

Standard Sewer Pipe and Fittings.

Standard Fire Brick.

Special Fire Brick and Tile Shapes to order.

FACILITIES

Our plant is located at Portland, Me., within the terminals of the Boston & Maine, Maine Central and Grand Trunk Railroad Systems. These rail connections coupled with our splendid docking facilities enable us to procure low freight rates and make shipments to all parts of the world.

SERVICE

Our motto is service, and if you will send us your blue prints on which to figure we will gladly furnish prices and samples. Further data concerning anything mentioned on this page will be furnished promptly and we are always pleased to consider the manufacture of special products in our line.

ACID RESISTING BRICK

We are large manufacturers of digester brick for lining sulphite pulp digesters, absorbing towers, reclaiming tanks, acid tanks, pickling vats, leaching batteries, bleach tanks, acid tower brick, acid floor brick, tile, etc. Our brick enjoys the enviable reputation for reliability and durability. While all acid resisting brick will disintegrate to a certain extent in the course of time, it has been found that our products, on account of the care taken in the selection of materials and our experience in manufacturing, will last much longer than the average. The best proof of this statement is the large number of important manufacturers who insist on using our products in preference to any other.

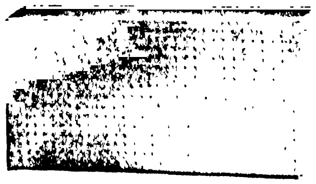
PULP DIGESTER SHOWING BRICK LINING

COMPLETE BRICK LINED BLOW-PITS

New sulphite mills or plants contemplating renewals of old wooden blow-pits are fast adopting the more up-to-date Complete Brick Lined Blow-Pit, considering that it is almost as essential to have the roof, sides and bottoms of a blow-pit lined with brick as it is to line a sulphite digester with brick.

VITRIFIED DRAINER BRICK

Our Vitrified Drainer Brick with straight edge were first introduced by us for draining rag pulp and bleach drainers in paper and pulp mills and are recognized as standard for this kind of work. The cut of Beveled Edge Drainer Brick below is a type especially adapted for sulphite blow pits and is fast displacing the old perforated plank drainers, being held in place by V-shape strips of wood. They cannot be displaced by pressure from underneath.

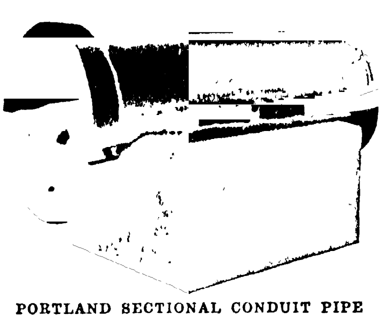


BEVELED EDGE DRAINER BRICK

Chemical Engineers will find this material useful whenever it is desired to construct equipment for washing, leaching, filtering or draining materials on a large scale. For instance, in bleacheries, textile finishing plants, dye houses, tanneries, pulp and paper mills, chemical works, food products, etc. The floor of the tank, being completely level and free from all irregularities, can be washed or flushed off readily and it is of sufficient strength to permit workmen to walk on it for purposes of washing, scraping or removing materials.

PORTLAND SECTIONAL CONDUIT PIPE

This illustration represents a slotted section of conduit pipe resting on a cement base. Imbedded in this base are two iron sockets which extend up through slots in the clay pipe to carry the roll frames which are recommended for supports of heavy lines of steam pipe. On smaller lines we furnish a type of roller frame which cements to the inside surface of pipe and requires no base under it. This type of clay conduit pipe is so cut that when sections are placed together it affords a watershed joint that is more practical than the old fashioned channel pipe, and these special sections for carrying roll frames are much less expensive than the old cumbersome T-joints. This form of insulation is especially adapted for distributing steam from central heating plants to outlying buildings.



PORTLAND SECTIONAL CONDUIT PIPE

R. D. WOOD & CO.

Engineers—Machinists—Iron Founders

400 Chestnut St., PHILADELPHIA, PA.

PRODUCTS

Cast Iron Pipe and Fittings; Gate Valves; Check and Foot Valves; Fire Hydrants; Centrifugal Pumps; Gas Producers; Gas Holders; Large Loam Castings; Sugar House Machinery; Hydraulic Machinery.

Constructors of Gas and Water Works and Complete Producer Gas Installations.

CAST IRON PIPE AND FITTINGS

Our pipe and fittings are based on the specifications of the American Society for Testing Materials and the American Water Works Association For unusual sizes not given in the above specifications, we follow the general line and formula used in calculating the regular tables

We have for many years made a specialty of the manufacture of cast iron pipe of all kinds and sizes; our experience dates from the introduction of pipe into this country.

Our regular sizes now range from 1″ to 84″ inside diameter All our pipe is tested under water pressure at our works before shipment We aim to carry a full line of regular sizes, and can make prompt shipment to any part of the world.

In addition to the regular bell and spigot pipe we carry a large line of flanged and flexible joint pipe, and are prepared to furnish at all times turned or bored pipe similar to that used in England and on the Continent of Europe We also have patterns for High Pressure pipe as well as Special Hydraulic and Condenser pipe

"REDUCED FITTINGS"

These were placed on the market by us some years ago, to meet a demand for fittings to be sold at a fixed price, instead of so much per pound Outside of the large saving per piece, compared with price of regular gas and water fittings, they have the advantage of more ease in handling in a tight trench, and will fit where the longer fittings would be clumsy and necessitate the cutting of the pipe This assures better and speedier work in fitting.

MATHEWS' PATENT FIRE HYDRANTS

We invite particular attention to this hydrant, and claim that it is the most perfect hydrant that has yet been made

With our method of enclosing the working parts in bronze, we consider these hydrants practically indestructible.

MATHEWS' PATENT BRONZE LINED FIRE HYDRANT

ADVANTAGES

Especial attention is directed to the anti-freezing qualities of these hydrants The outside casing, the upper end of which makes a telescopic joint with the body, or post, of the hydrant, adds finish and strength Below the ground line it serves to form a dead-air chamber around the hydrant stock, thus providing a non-conductor, making the hydrant very secure against freezing, and obviating the necessity for packing or covering in extreme cold weather The hydrant is therefore especially adapted for service in cold climates The case has an end play or vertical motion of several inches independent of the hydrant proper, accommodating itself to the upheaval of the ground by frost, and effectually preventing the fracture of the hydrant or foot-bend This sliding case is invariably furnished with Mathews' Hydrants, as even in warm climates it serves a further purpose, in admitting of the removal of the hydrant stock with all its working parts, including valves and valve seats, without digging up the ground about the hydrant. This lessens the cost of repairs.

AUTOMATIC WASTE VALVE

The waste valve of this hydrant is positive and automatic, being so attached to the valve-rod that when the main valve is open the waste must be closed, when the main valve is closed, the waste is open, allowing the waste water to escape from the standpipe The guides of the waste valve are closely fitted to grooves in the standpipe, so that there is no vibration in opening or closing the hydrant under any pressure, the rod and main valve being held rigidly to the center

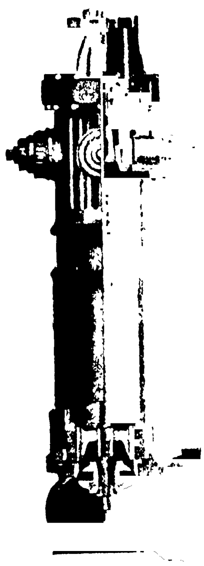
MAIN VALVE

This is made of the best oak-tanned sole leather, thoroughly hammered and pressed, then turned in a lathe on its own centers to fixed gauges; thus they are readily interchangeable. Being turned to conical form to fit the conical valve seats, the closing of the hydrant is so gradual that there is no possibility of the "water hammer"

As the valve opens downward against the pressure of the water, the pressure is utilized in closing and holding the valve in place, and prevents loss of water or flooding of the streets in case the hydrant stock should be broken.

MATHEWS' HIGH PRESSURE FIRE HYDRANTS

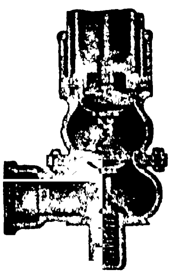
The installation in the United States and Canada of independent fire systems has resulted in greatly increased fire protection and a consequent reduction in in-



MATHEWS' HIGH PRESSURE HYDRANT

Continued on Next Page

surance rates We have designed a high pressure fire hydrant along the lines of our standard Mathews' Hydrant, which has proved itself thoroughly reliable under the working pressure required by fire engineers throughout the country This has been accomplished by means of a relief valve, which is attached to the main operating stem, and opens on the first few turns of the wrench, permitting the water to enter the body of the hydrant, equalizing the pressure and relieving strain on the main valve proper

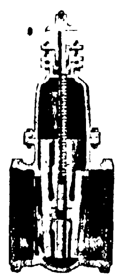

MATHEWS' PATENT DOUBLE VALVE FOR FIRE HYDRANT

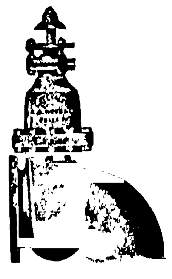
MATHEWS' PATENT DOUBLE VALVE FIRE HYDRANTS

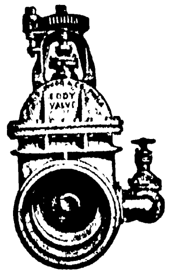
This form of hydrant affords double security against leakage by the use of two main valves, one above the other The lower valve is so constructed as to act as a supplemental or auxiliary valve, to allow the hydrant to be taken up without shutting off the water in the district.

GATE VALVES

We manufacture gate valves of various types and dimensions from 2″ to 30″ in diameter All these valves are tested before shipment to 300 lbs water pressure, and are carefully built to standard templets We have special types of gate valves for use with our high-pressure fire hydrants


STANDARD GATE VALVE


ANGLE VALVE


BY-PASS VALVE GEAR OPERATED

Our valves may be fitted with indicator posts, sliding stem and lever, and valve indicators Angle valves with full size elbows can also be furnished Large valves can be furnished with gears and by-passes

ADJUSTABLE VALVE AND SERVICE BOXES

These are easily set and readily adjustable to variations in grade.

INDICATOR VALVE POST

This patented post shows plainly to the passerby whether the valve is open or shut, thus avoiding the delay of hunting under snow or dirt for a flush gate box, or delay in opening the cover of the box Turning the spindle screws the tell-tale up or down so the proper sign appears in the opening at the head of the post Locks and hand-wheels may be applied if desired.

RESERVOIR AND PUMP-HOUSE CONNECTIONS

Our standard designs meet the requirements in all essential details. Special forms are made to plans of customers.

HYDRAULIC TOOLS

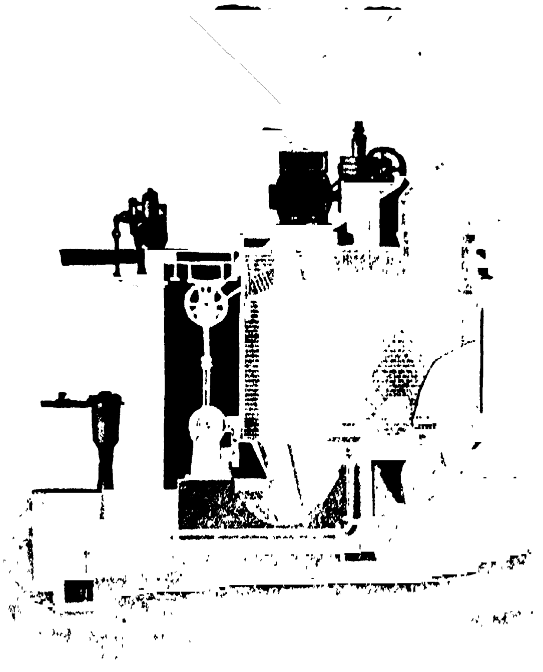
We design and build hydraulic tools for standard and special applications, including Flanging and Bending Presses, Intensifiers, Tower Cranes, Forging Presses, Automatic Punches, Pulpit Valves, Plate and Billet Shears, Hydraulic Operating, Check and Stop Valves, Beam Shears, Jib Cranes, etc Send for our special catalog

GAS HOLDERS

We design, construct and erect gas holders of both single and multi-lift type, without or with steel tank

AUTOMATIC GAS PRODUCERS

The large number of plants equipped with the Automatic Gas Producer have marked a new era in economical coal gasification which is worthy of investigation We have prepared a special circular, which will be sent upon request We welcome inquiries from those interested.

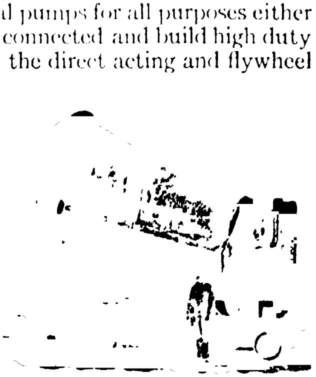

AUTOMATIC GAS PRODUCER

PUMPING INSTALLATIONS

We install complete pumping installations for steel works, mines, drainage, irrigation and water works. We can supply centrifugal pumps for all purposes either belt connected or direct connected and build high duty pumping engines of both the direct acting and flywheel type

SPECIAL CASTINGS AND MACHINERY

We are prepared to furnish heavy loam castings of any size or weight for the chemical industries, also sugar house machinery and special equipment for all types of industrial plants.


SPECIAL CASTING

WORTHINGTON PUMP AND MACHINERY CORPORATION

115 BROADWAY, NEW YORK, N. Y.

FACTORIES

Blake Knowles Works
East Cambridge Mass
Deane Works Holyoke Mass
Snow Holly Works Buffalo N Y
Laidlaw Works, Elmwood Pl Ohio

Worthington Works Harrison N J

WORTHINGTON

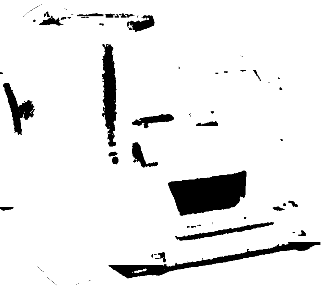
Gas Engine Works, Cudahy, Wisc
Epping Carpenter Works
Pittsburgh Pa
Power and Mining Works
Cudahy, Wisc
Jeanesville Works, Hazleton, Pa

PRODUCTS

Pumps	Oil Engines
Condensing Apparatus	Gas Engines
Air Compressors	Kerosene Engines
Gas Compressors	Oil Mill Machinery
Ammonia Compressors	Rock and Ore Crushers
Filter Presses	Converters
Water Wheels	Cement Machinery
Feed Water Heaters	Metal Mining Machinery
Liquid Meters	

OPEN IMPELLER CENTRIFUGAL PUMPS, Class "C"

These pumps are especially suitable for contracting work, such as pumping out ditches and cofferdams. These pumps meet those situations calling for machines of sturdy design and reliable operation, where first cost is important. Belt driven standard, motor driven to order.



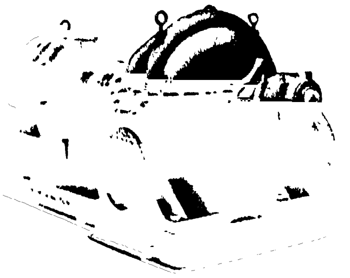
OPEN IMPELLER CENTRIFUGAL PUMP

CAPACITIES IN GAL. PER MIN, R P M. AND MOTOR HORSE-POWER

Size	Head or lift in feet				Size	Head or lift in feet			
	20	40	60	80		20	40	60	80
1" G P M	18	26			3" G P M	232	330	402	465
R P M.	1650	2320			R P M	700	1070	1310	1515
H P.	.75	1.5			H P.	3.25	8.0	13.5	21
1¼" G P M.	35	50			4" G P M	430	610	746	860
R P M	1385	1960			R P M	650	920	1120	1300
H P.	.75	1.75			H P	5.25	13.5	23	35
1½" G P M.	72	102	125		5" G P M	640	905	1110	1280
R P M.	1100	1550	1900		R P M	550	780	950	1090
H P.	1.5	3.5	6.5		H P	7.5	18.5	32	50
2" G P M	95	134	161	190	6" G P M	810	1142	1400	1620
R P M	935	1320	1620	1870	R P M	474	670	820	950
H P.	1.5	4.0	7.0	11	H P.	8.5	18	35	53
2½" G P M.	140	197	242	278	8" G P M	1150	2050	2500	2900
R P M.	785	1110	1360	1570	R P M	410	578	706	815
H P.	2.0	5.0	8.5	13	H P.	14.5	35	61.5	93

DOUBLE SUCTION VOLUTE PUMPS, Class "B.S." and "O.S."

These pumps were designed for those conditions requiring a high grade efficient pump. The double suction principle insures freedom against end thrust. A number of design refinements such as a volute suction head contribute to make these machines especially efficient. Sizes 3" to 12" discharge. Capacities up to 7000 gal. per min. Suitable for heads or lifts up to 200 feet.



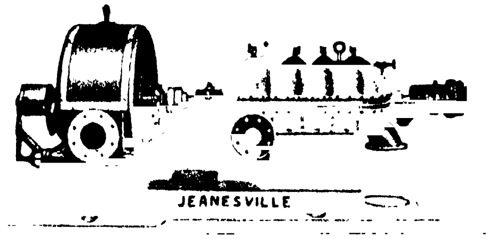
DOUBLE SUCTION VOLUTE PUMP

Patterns are on hand for larger sizes, up to 60", which can be built to meet special requirements.

This pump is designed with a great number of industrial and service requirements in mind. The result is a machine suitable for many services in a standardized product. Slight modifications can be made to meet unusual service conditions. This pump has been used for pumping brine, light oils, mine water, acidulous water, sewage, slimes, etc.

MULTISTAGE CENTRIFUGAL PUMPS

The pump illustrated is a double suction multistage centrifugal pump. It has been especially designed for boiler feeding in the small and medium sized units—and has given excellent results as a water works pump and mine pump in the larger sizes.



MULTISTAGE CENTRIFUGAL PUMP

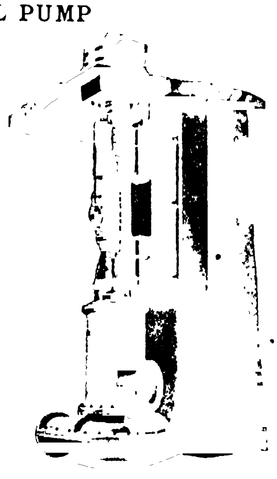
Sizes range from 4" to 10". Boiler horse-power capacity 2,000 to 35,000 per unit. Gallons per minute capacity ranges from 250 to 3,500. Suitable for any head or pressure over 160 feet or 70 pounds.

In addition to the pump described, there are a number of other multistage centrifugal pumps. These other designs are made in a range of sizes and types to include all high head pumping services.

WORTHINGTON ANTISELL BOOTLEG VERTICAL CENTRIFUGAL PUMP

This pump was designed especially for handling solutions of sulphuric and mixed acids, and in connection with leaching processes. The impeller and casing are of special lead antimony composition and the design is such as to insure low velocity of solution throughout and consequent reduction of erosion and corrosive action on the lining. The elimination of stuffing boxes is a large factor in reducing wear.

Sizes 2½" to 15" will handle from 100 to 4000 g.p.m. against moderate heads.

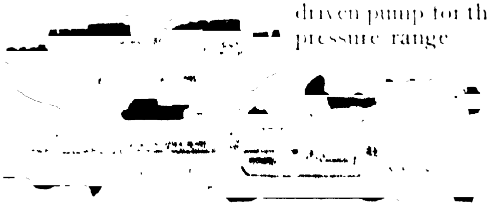


WORTHINGTON ANTISELL BOOTLEG VERTICAL CENTRIFUGAL PUMP

Continued on Next Page

POT VALVE DIRECT ACTING STEAM PUMPS

The pump illustrated, while designed primarily for boiler feed service pressures up to 300 lbs., is also suitable for any clear water service requiring a steam driven pump for that pressure range.



POT VALVE DIRECT ACTING PUMP

In addition to the design shown, Worthington manufactures a complete line of pot valve high pressure steam pumps. This line embraces pumps suitable for pressures up to 2000 lbs., and in a list of sizes up to their largest triple expansion and cross compound Corliss pumping engines.

DIRECT ACTING PISTON STEAM PUMPS

General Service Pattern—This is the standard trade pump for all ordinary services, and for water pressures not in excess of 200 pounds per square inch. These pumps are suitable for boiler feeding and all general water supply purposes. The water cylinders are brass-lined, the packed water pistons are submerged, and the water valve service is of composition. Bronze rods and brass water pistons are included in the regular construction of the first four sizes. On all other sizes these brass parts are extras and only furnished when especially ordered.

DIRECT ACTING PISTON GENERAL SERVICE PUMP

SIZES AND CAPACITIES

150 pounds steam pressure 200 pounds water pressure

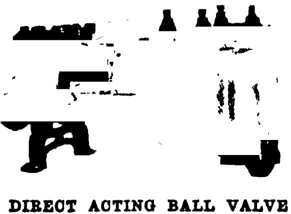
Dia Steam Cylinders	3	3½	4½	5¼	6	7½	7½	9	10
Dia Water Pistons	2	2¼	2¾	3½	4	5	4½	5¼	6
Stroke	3	4	4	5	6	6	10	10	10
Gallons per Stroke Each Piston	.041	.069	.103	.208	.326	.510	.690	.940	1.22
Single Strokes per Minute Each Piston	110	100	100	90	80	80	70	70	70
Gallons per Minute	9	14	21	37	52	82	97	131	171

Other sizes up to 515 gallons capacity per minute. Water pressure 150 pounds

Removable Lining Pattern—This pattern has been designed for severe services where the pump is subject to unusual wear, owing to the presence in the water of large quantities of grit, or due to any other cause. The water cylinders are fitted with brass linings, flanged, which are readily removable without taking out the pump. When the cylinder head has been taken off the linings may be withdrawn and replaced as easily as the pistons. This design is, of course, more expensive than the standard pattern, but will be found most useful for situations such as indicated above.

Sizes the same as general service pattern from 4½ x 2¾ x 4 on up.

Ball Valve Pattern—Made in the same and larger sizes as the removable lining pattern. Especially adapted for pumping tar and other heavy liquids.



DIRECT ACTING BALL VALVE PISTON PUMP

Other Patterns—Besides the piston steam pumps described, Worthington makes a complete line of simplex and duplex pumps. These machines are manufactured in such sizes and types as to provide a pump suitable for every service requirement.

FIRE PUMPS

Worthington fire pumps meet all the requirements of the various underwriters and are built in full accordance with underwriter specifications.

Besides the steam driven fire pumps shown there are other types available of Worthington make. These include power and centrifugal pumps.

DUPLEX DIRECT ACTING UNDERWRITER FIRE PUMP

SIZES AND CAPACITIES

Diameter of Steam Cylinders, Inches	11	16	18	20
Diameter of Water Plungers, Inches	7¼	9	10	12
Length of Stroke, Inches	12	12	12	16
Underwriter Rtg				
Gallons per min	500	750	1000	1500
R P M	70	70	70	60
No of Fire Streams	2	3	4	6

FEATHER VALVE VACUUM PUMPS

(Reg U P Pat Off)

These pumps are made with the same valves which have made Worthington Air Compressors so universally successful.

These Worthington **Feather** (Reg. U. S. Pat. Off.) Valve dry vacuum pumps are used where high grade, economical vacuum pumps are desired. They produce and maintain a high vacuum with but little horse power expended for driving the machine. Repairs and upkeep are quite low.

FEATHER (Reg U S Pat. Off) VALVE VACUUM PUMP

Besides the belt or power driven machines displayed and tabulated Worthington makes also a similar number of steam driven pumps.

SIZES AND CAPACITIES

Single Cylinder Machines						Duplex Machines					
Size Inches		Revs per Minute	Displacement Cu Ft per Min	Brake H P Required		Size Inches		Revs per Minute	Displacement Cu Ft per Min	Brake H P. Required	
Vacuum Cylinder	Stroke			27" Vacuum	Peak Load	Vacuum Cylinder	Stroke			27" Vacuum	Peak Load
7½	6	300	92	3.0	5	18	12	200	1400	36	76
8½	9	250	147	4.5	8	21	14	185	2040	52	110
12	9	250	290	7.5	14	23	16	165	2520	64	136
18	9	225	590	15	32	26	18	150	3300	84	180
18	12	200	700	18	38	26	24	125	3660	94	200
21	14	185	1020	26	55	30	18	150	4400	114	236
23	16	165	1260	32	68	30	24	125	4900	126	256
26	18	150	1650	42	90	34	30	100	6300	154	330
26	24	125	1840	47	100	39	39	75	8000	200	420
30	18	150	2200	57	118						
30	24	125	2450	62	128						
34	30	100	3150	77	165						
39	39	75	4000	100	210						

Various sizes of the single cylinder two stage type are also available

Continued on Next Page

VERTICAL TRIPLEX POWER PUMPS

The three following illustrations cover the most popular triplex power pumps made by Worthington.

Fig. 1693 is a general service pump suitable for clear liquid service up to 150 pounds pressure. It is a substantial, reliable general utility pump.

FIG. 1693, TRIPLEX POWER PUMP

LIST OF SIZES SUITABLE FOR 150 POUNDS PRESSURE

Dia of Plunger	Length of Stroke	Gallons per Rev	Displacements Normal Rev per Min	Normal Gal per Min	Maximum Rev per Min	Maximum Gal per Min	Ratio of Gearing
1¾	4	.122	50	6.1	75	9.15	5-1
3	4	.367	50	18.3	68	24.95	5-1
4	4	.652	50	32.6	68	44.33	5-1
4	6	.979	50	49.0	58	56.78	5-1

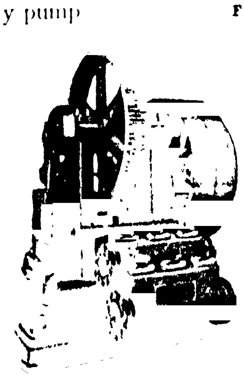


FIG 2273, TRIPLEX POWER PUMP

LIST OF SIZES, FIG 2273

Dia of Plunger	Length of Stroke	Max Pressure	Gal per Rev	Displacements Normal Rev per Min	Normal Gal per Min	Maximum Rev per Min	Maximum Gal per Min	Ratio of Gearing
4	6	250	.98	50	49	55	54	4.91-1
5	6	150	1.53	50	76	58	89	4.91-1
4	8	250	1.30	45	58	50	65	4.66-1
5	8	150	2.04	45	91	50	102	4.91-1
5	8	200	2.04	45	91	50	102	4.66-1
5	8	250	2.04	45	91	50	102	4.88-1
6	8	100	2.93	45	132	50	146	4.91-1
6	8	150	2.93	45	132	50	146	4.66-1
6	8	200	2.93	45	132	50	146	4.88-1
7	8	100	4.00	45	180	50	200	4.99-1
7	8	150	4.00	45	180	50	200	4.88-1
8	8	125	5.22	45	235	50	261	4.88-1

Fig. 2273 is popular where a machine of the highest grade is desired. In the design particular attention has been paid to the ease and economy of effecting repairs. It is a thoroughly high grade pump in every respect.

For high pressure work there are a number of machines made by Worthington similar to Fig. 1845. These pumps are made in a great number of sizes and are suitable for pressures up to 10,000 lbs. per square inch.

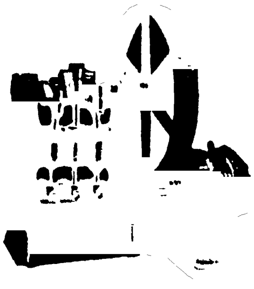
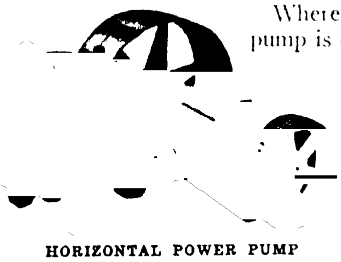


FIG. 1845, TRIPLEX POWER PUMP

HORIZONTAL POWER PUMPS



HORIZONTAL POWER PUMP

Where a horizontal power pump is desired the machine illustrated is quite popular as a general service pump.

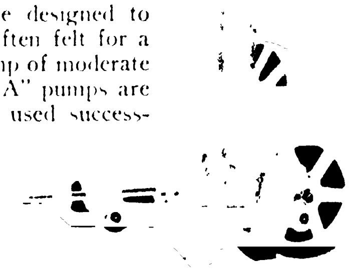
Other sizes and types are made in a line which covers pumps suitable for large and small capacities and pressures up to 10,000 pounds.

SIZES AND CAPACITIES HORIZONTAL POWER PUMPS

Size	Normal R P M	Normal G P M	Maximum R P M	Maximum G P M	Gear Ratio	Maximum Pressure
3 x 4	45	22	65	32	4.07-1	150
3¾ x 4	50	38	75	57	5.00-1	120
4 x 6	40	81	60	122	5.00-1	100
6 x 6	40	117	60	175	5.00-1	75
7 x 6	40	160	60	240	4.76-1	100
8 x 6	40	208	60	313	4.76-1	85
8½ x 6	40	235	60	352	4.76-1	75

MODEL "A" POWER PUMPS

These pumps are designed to meet the need so often felt for a simple, reliable pump of moderate first cost. Model "A" pumps are well built and are used successfully on general water supply, and any kind of cold clear liquid pumping where heads are most excessive.



MODEL "A" POWER PUMP

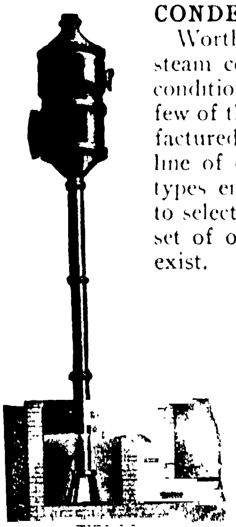
LIST OF SIZES; CAPACITIES, ETC

Good for a lift or head of 175 ft or 75 lbs maximum pressure

Diameter of Pistons	3	4	5	6	6
Length of Stroke	5	5	5	6	12
Gallons per Revolution	.304	.540	.848	1.47	2.94
Revolutions per Minute	50	50	50	50	40
Gallons per Min Piston Displacement	15	27	42	73	117
Pulley Diameter	12	16	16	20	24
Ratio of Gearing	5 to 1	5 to 1	5 to 1	5 to 1	5 to 1
Horse Power Required for Lift of 25 Ft	.3	.5	.7	1.3	2.0
Horse Power Required for Lift of 175 Ft	1.5	2.3	3.5	6.2	10.0

CONDENSING EQUIPMENT

Worthington is prepared to furnish steam condensing equipment for any conditions. The illustrations cover a few of the many different types manufactured. Having such a complete line of condensers of all the various types enables Worthington engineers to select the proper apparatus for any set of operating conditions that may exist.

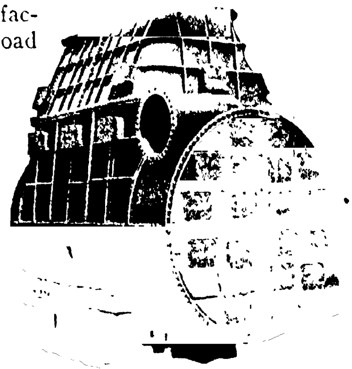


BAROMETRIC CONDENSER

SPIROJECTOR CONDENSER

Being pump manufacturers on such a broad scale enables this same type-selection idea to be carried out in determining what condenser auxiliaries will best suit the needs of the condenser selected.

Bulletin W-701 describes in further detail Worthington condensing machinery.



SURFACE CONDENSER

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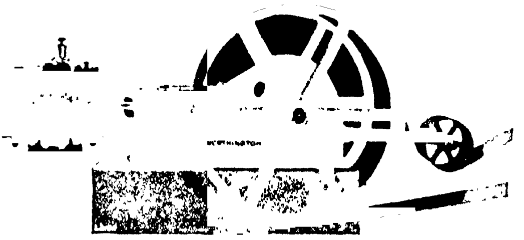
FEATHER VALVE AIR COMPRESSORS

(Reg U. S. Pat Off)

All the air compressors illustrated here are equipped with the patented Worthington **Feather** (Reg U. S. Pat. Off.) Valve. This valve consists of a set of ribbon steel strips which, when seated, cover the ports in a flat valve seat. In opening each strip rises in the center while the ends stay on the seat, the air passes around the strip. In seating the action is an even increase in the contact of the strip on the seat. The action is quiet and efficient. The valve does not slam on its seat, cannot chatter and wear is reduced to an absolute minimum.

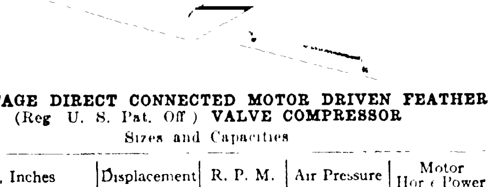
These machines are made in a wide variety of sizes and types. Some typical sizes are given for air compressors. Gas Compressors for CO, oxygen, natural gas and ammonia are also available in a large number of sizes and types. All are **Feather** (Reg U S. Pat. Off.) Valve equipped.



SINGLE BELT DRIVEN FEATHER (Reg U S Pat Off) VALVE COMPRESSOR

SIZES AND CAPACITIES, AIR COMPRESSORS

Single Belt Driven						Single Steam Driven					
Cylinder Diameter	Stroke	R P M	Displacement	Air Pressure	Motor Horsepower	Size Steam Cylinder	Air Cylinder	Stroke	Air Pressure	Displacement	R. P. M.
7½	6	350	106	80-100	15-17	7	7½	6	80-100	106	350
8½	9	300	170	80-100	25-28	8	8½	9	80-100	170	300
10	10	285	250	80-100	37-42	9	10	10	80-100	245	275
11	12	270	350	80-100	51-58	10	11	12	80-100	338	260
13	14	245	522	80-100	75-84	12	13	14	80-100	500	235
15	16	220	710	80-100	98-118	14	15	16	80-100	680	210
11	10	285	312	40-55	35-43	9	11	10	40-60	300	275
13	12	270	495	40-55	55-69	10	13	12	40-60	475	260
15	14	245	695	40-55	76-92	12	15	14	40-60	665	235
18	16	220	1030	40-55	112-136	14	18	16	40-60	981	210
12	9	300	335	20-30	28-35	8	12	9	30	335	300
13	10	285	435	20-30	35-45	9	13	10	30	418	275
15	12	270	660	20-30	54-69	10	15	12	30	632	260
18	14	245	1000	20-30	78-96	12	18	14	30	961	235
22	16	220	1540	20-30	116-146	14	22	16	30	1470	210



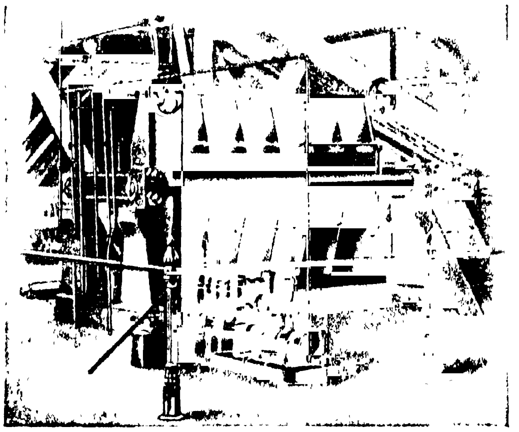
TWO STAGE DIRECT CONNECTED MOTOR DRIVEN FEATHER (Reg U. S. Pat. Off) VALVE COMPRESSOR

Sizes and Capacities

Size, Inches	Displacement	R. P. M.	Air Pressure	Motor Horse Power
13 & 8 x 10	455	300	80-100	72-81
15 & 9½ x 12	670	277	80-100	108-121
18 & 11 x 14	1050	257	80-100	166-186
22 & 13 x 16	1570	225	80-100	235-265
24 & 14 x 18	1860	200	80-100	292-326
27 & 16½ x 18	2350	200	80-100	347-390
27 & 16½ x 21	2470	180	80-100	380-420
30 & 18 x 21	3050	180	80-100	475-530
27 & 16½ x 24	2575	164	80-100	390-435
30 & 18 x 24	3200	164	80-100	500-560

FILTER PRESSES

Besides the filter press shown in the illustration, Worthington has acquired the patterns and rights of the filter press formerly built by the Platt Iron Works, Dayton, Ohio. These two complementary lines enable Worthington to select the proper press for any particular work under consideration. Worthington filter press service is therefore complete.



FILTER PRESS

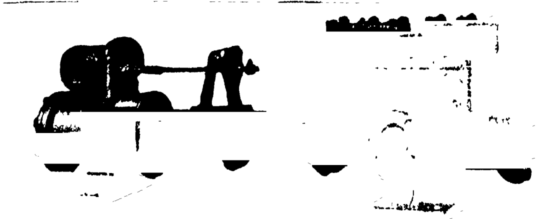
FILTER PRESS PUMPS

Worthington has developed a line of pumps especially for filter press work. One pattern with list of sizes is shown.

These filter press pumps are fitted with ball valves and have liquid passages of generous dimensions. These features insure reliable operation when handling the semi-liquid substances found in filter press work.

SIZES AND CAPACITIES

Pump Sizes Inches Steam Cylinder	Water Cylinder	Stroke	mm Steam Cylinder	Water Cylinder	Stroke	Capacity per Stroke Gallons	Litres	Single Strokes per Minute	Capacity per Minute Gallons	Litres
5½	3	7	140	76	178	.21	.79	100	21	79
6½	4	8	165	102	203	.43	1.63	100	43	163
8	5	12	203	127	305	1.02	3.86	75	76	288
10	6	12	254	152	305	1.47	5.57	75	110	417
12	7	12	305	178	305	2.00	7.57	75	150	568



DIRECT-ACTING FILTER PRESS PUMP

G. WOOLFORD WOOD TANK MANUFACTURING CO.

Established 1854

LINCOLN BUILDING, PHILADELPHIA, PA.

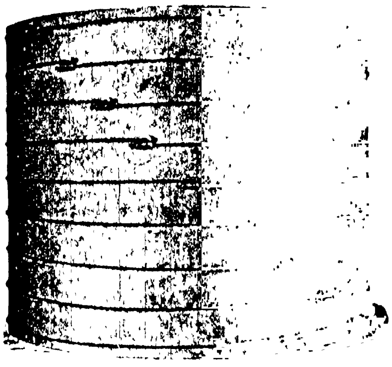
FACTORY DARBY, PA

PRODUCTS

Wood Tanks, all shapes, all sizes, for all purposes, manufactured from best grades of all lumber. Silos for slate, lime, coal and agricultural purposes.

FACILITIES

Our factory is completely equipped with all modern electrically driven wood working machinery, operated by skilled workmen. A large stock of thoroughly seasoned tank lumber in all the best grades insures quick delivery on quantity production. No tanks are too small or too large for our facilities and stock.



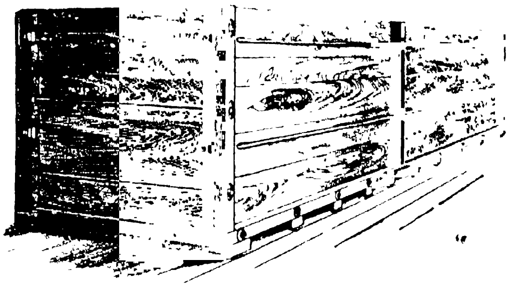
ROUND WOOD TANK

The best and most economical shape to use

CONSTRUCTION

Machine made regular tanks, both circular and rectangular, eliminate variations and assure perfection of construction. All tanks hooped and braced commensurate with size and gravity of contents.

Requirements for tanks or tubs of irregular shapes and special features, or containers for the manufacture and storage of acid and other chemicals, the construction of which you are in doubt, should be submitted to our Technical Department for advice, cost, kind and grade of material and detail of construction. Expert workmen, specially trained, are employed exclusively upon this character of work.

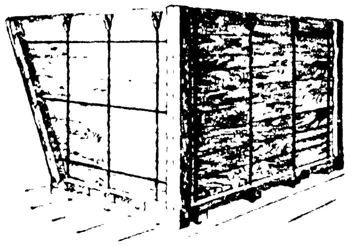


RECTANGULAR TANK WITH RODS THROUGH WOOD

Long tanks are braced at center

ADVANTAGES OF WOOD TANKS FOR CONTAINERS

Low initial cost of installation. Your own men can assemble, as all parts are properly marked and numbered, low maintenance, non-conductors of heat or cold; non-corroding; made in any shape to fit any machinery, at minimum cost.

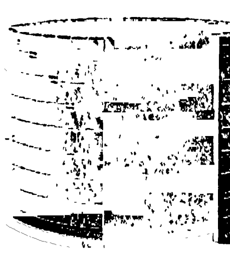


RECTANGULAR TANKS WITH ALL RODS OUTSIDE OF WOOD

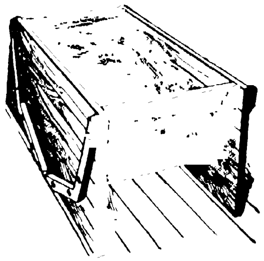
Any or all sides can be made sloping or straight

SPECIAL TANKS FOR CHEMICAL INDUSTRIES

Tanks for chemical plants are a specialty with us. Give our tanks a trial wherever you have difficulty, or are in need of new ones. They have successfully replaced those of other materials and design in many large plants.



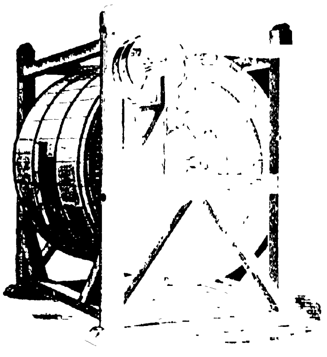
ROUND TANKS CAN BE CLOSED AT TOP AND DIVIDED INTO AS MANY COMPARTMENTS AS NECESSARY



HALF ROUND TANK

LITERATURE AND ESTIMATES

Literature giving illustrations and detail of construction of tanks for every purpose supplied. Estimates of cost with or without installation, furnished on receipt of your specifications. Drawings will accompany estimates for special designs if desired.



DRUM FOR MIXING OR WASHING

Can be driven with gears or sprocket chain

WRIGHT-AUSTIN COMPANY

Manufacturers of Steam Specialties

DETROIT, MICH., U. S. A.

BRANCH OFFICES New York Chicago Boston

PRODUCTS

Receiver Pumps; Steam Traps; Air Traps; Strainers; Catchalls, Steam Separators; Oil Separators; Vacuum Separators; Air Separators; Exhaust Heads; Water Columns for Boilers; Boiler Feed Regulators; Pump Governors.

EXPERIENCE

Twenty-five years of designing, building and studying the every day problems of separation of moisture from steam and vapors under all manners of conditions and pressures, also oil from exhaust steam and vacuums, has given our engineering department a broad and practical experience. This department is always ready to discuss and cooperate with you on any steam, vapor, air or condensation problems.

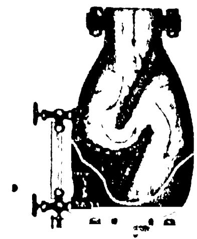


FIG. "A"
Austin Live Steam Vertical Iron Separator

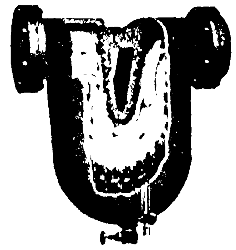


FIG "B"
Austin Live Steam Horizontal Iron Separator

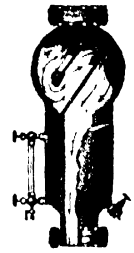


FIG. "M"
Austin Live Steam Vertical Iron Receiver Separator

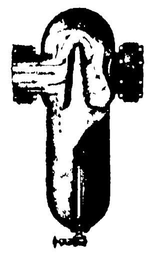


FIG. "E"
Austin Live Steam Horizontal Iron Receiver Separator

FIG. "S"
Austin Horizontal Self-Cleaning Oil Separator for Use on Exhaust Steam Lines

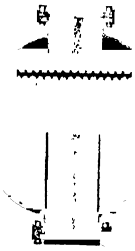


FIG. "R"
Austin Vertical Oil Separator

THESE FEW ILLUSTRATIONS SERVE TO SUGGEST THE VERY COMPLETE LINE OF AUSTIN STEAM AND OIL SEPARATORS IN REGULAR PATTERNS

There is an **Austin** Separator for every purpose.

WRIGHT "EMERGENCY" 3-VALVE HIGH PRESSURE STEAM TRAP

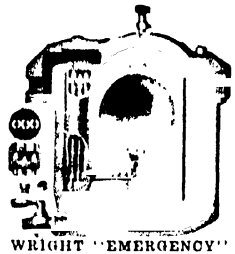
Four great advantages in one simple compact trap

1. Adapted for any working pressure up to 200 lbs. without adjustment or change of parts

2. Enormous discharge capacity, provided by three valves

3. Automatically adjusts itself to any service.

4. Eliminates almost entirely the wear on the Monel Metal valves and seats.



WRIGHT "EMERGENCY" HIGH PRESSURE CONTINUOUS FLOW STEAM TRAP

DATA

Size No. of Trap	1	2	3	4	5	6	7	8
Size of inlet and outlet	½"	¾"	1"	1¼"	1½"	2"	2½"	3"
Distance through inlet and outlet	11¼"	12"	13¼"	13¾"	14¾"	16½"	18"	19¼"
Height	10¼"	12"	13¼"	13¾"	15"	16¾"	17¼"	18½"
Shipping weight, lbs	70	100	120	140	160	220	200	320
List price	28.00	32.00	38.00	45.00	63.00	86.00	132.00	150.00

CAPACITY OF WRIGHT 3-VALVE TRAP AT VARIOUS PRESSURES

Maximum discharge in pounds of water per hour at pressure of	Size Number	1	2	3	4	5	6	7	8
	Pipe Size	½"	¾"	1"	1¼"	1½"	2"	2½"	3"
	10 lbs	2000	2400	3100	4000	5500	7000	11500	16100
	20 lbs.	2500	3200	4050	5960	7800	10300	16500	22800
	30 lbs	2900	3700	4800	7000	9300	12400	20200	28000
	40 lbs	3200	4200	5300	7800	10500	13800	22600	31500
	50 lbs.	3500	4500	5700	8400	11300	15000	24900	34800
	75 lbs	4000	5100	6400	9500	13100	17400	29200	41000
	100 lbs	4400	5600	7100	10400	14400	19200	32500	45900
	125 lbs	4700	6000	7600	11200	15600	20800	35300	49800
	150 lbs	4900	6300	8100	12000	16700	22400	38000	53700
	175 lbs	5100	6700	8600	12800	17800	23960	40700	57600
	200 lbs	5300	7000	9000	13700	19000	25500	43500	61500

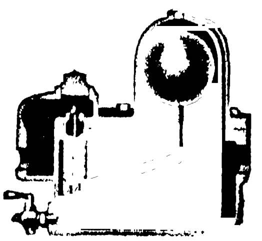
WRIGHT "VICTOR" LOW PRESSURE STEAM TRAP

For pressures from 0 to 20 lbs.

Extreme simplicity and great capacity are dominant features.

The Victor Trap has but three working parts, a round seamless copper float, one lever, one large valve.

This feature alone takes the bother and cost out of your trap maintenance.



WRIGHT "VICTOR" LOW PRESSURE AUTOMATIC CONTINUOUS FLOW STEAM TRAP

DATA

Size number of trap	Size of inlet and outlet	Distance inlet to outlet	Height of trap over all	Maximum discharge in pounds of water per hour at pressures of						Shipping weight	List price
				1 lb	3 lb.	5 lb.	10 lb	15 lb.	20 lb.		
0	½"	9¼"	9¼"	1125	1946	2500	3540	4340	5017	45	22.00
1	½"	12¾"	11¼"	2020	3494	4500	6360	7795	9000	70	28.00
2	¾"	14"	12½"	3040	5259	6770	9575	11735	13555	80	32.00
3	1"	15½"	14½"	3700	6400	8250	11650	14280	16500	100	38.00
4	1¼"	18"	15¼"	6880	11900	15340	21670	26555	30685	120	45.00
5	1½"	19½"	17½"	9550	16520	21290	30080	36860	42590	160	63.00
6	2"	22"	20"	11400	19720	25420	35910	44000	50845	200	86.00
7	2½"	23"	21"	14580	25220	32510	45920	56275	65025	255	132.00
8	3"	24"	22"	19920	34460	44420	62745	76890	88840	260	150.00

NOTE.—Every Trap carefully tested before leaving factory, and fully guaranteed.

1855 1921

A. WYCKOFF & SON COMPANY

MANUFACTURERS OF

Acidproof Wood Water Pipe

MAIN OFFICE AND FACTORY

ELMIRA, N. Y.

BRANCH OFFICES

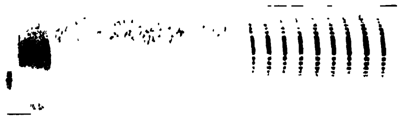
PITTSBURGH, PA
Johnson-Peter Co.,
Pittsburgh Terminal Warehouse

SCRANTON, PA
Valley Supply Co.,
Coal Exchange Building

ATLANTA, GA.
H. H. White
Fourth National Bank Building

PRODUCTS

Machine Made Wood Stave Pipe for Water Works Systems, Power Plants, Paper Mills, Manufacturing Plants, Mines, Railroad Water Supplies and Chemical Plants. Also underground Wooden Steam Pipe Casings.



PARTLY COATED PIPE
Protective coating omitted from one half of wood pipe to show steel bands

USES

Wyckoff Wood Stave Pipe is adapted for use as follows: (1) When normal or constant pressure does not exceed 160 lbs. (2) For a supply main, from source of supply (3) For penstocks. (4) For carrying water highly charged with acids mine water (hot and cold), mine culm, tan liquors, mineral spring waters; heavy fluids, pulps, brine, and gases in fertilizer works, paper mills or provision factories, also, diluted sulphuric, nitric, muriatic, acetic and tartaric acids

It is made from selected Canadian pine All staves are double tongued and grooved, with faces planed, under close inspection. Winding machine so arranged that staves are banded together or wound with a steel band, at desired uniform tension Pipe is rendered watertight by tightly squeezing tongues into grooves. Maximum pipe lengths, 12 ft ; shorter sections permit pipes to be laid on curves, without iron fittings.

SPECIAL ADVANTAGES

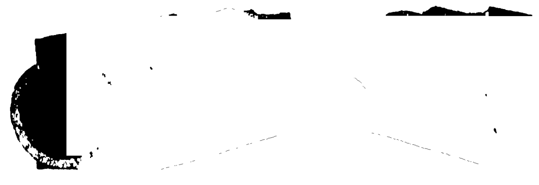
(1) Wyckoff Machine Made Wood Pipe is as durable as cast iron, and more durable than steel, is laid more cheaply than either and is as cheaply maintained; and will carry much more water, with equal diameter. (2) No skilled labor required to lay. (3) Narrow trench. (4) No electrolysis. (5) No corrosion by fumes and acids (6) No destruction of pipe by sulphur or other impurities in minerals. (7) Fluids are not contaminated. (8) Elasticity of wood retards bursting. (9) Can be laid in wettest kind of trench. (10) Pipe unaffected by salt water. (11) Montezuma asphalt coating, the best known protection to steel bands, is used exclusively.

SIZES OF WYCKOFF WOOD PIPE

All sizes from 1 inch to 48 inches in diameter promptly supplied.

DURABILITY OF WOOD PIPE

Wooden mains did efficient service in London, England, for over 63 years; in Philadelphia, Pa., and Burlington, N. J., for over 49 years; and in eastern cities of United States, for long periods of time.



SQUARE PIPE
Wyckoff Special Plain Square Wood Pipe bored from the solid white pine log for use in Tanneries and Chemical Plants

JOINT FITTINGS

For general purposes, special cast iron fittings are furnished, also to connect the wood pipe to cast iron pipe. Wooden crosses, tees and ells are made up to 10 inches in diameter, by properly boring heavy blocks cut from square timbers

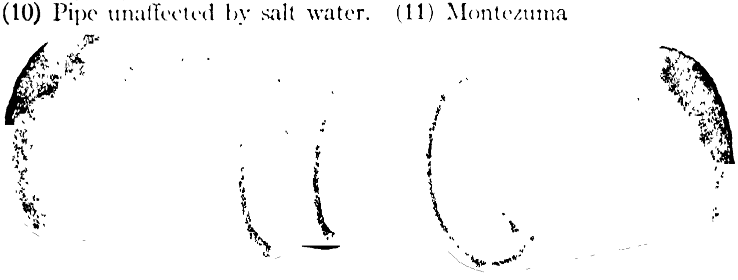
COST OF LAYING WYCKOFF PIPE

Cost of furnishing and laying is about one-third the outlay for cast iron pipe. No special labor or materials needed in making joints. Its lightness permits laying the largest sizes without use of block and fall.

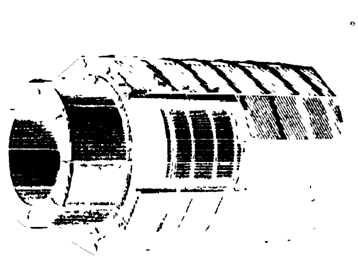
WYCKOFF'S IMPROVED STEAM PIPE COVERING

This covering is built of Cypress. The Wood Eternal. The inner shell of 2 inches and outer shell of 1 inch, with ¼ inch dead air space between has proved to be the best known protection for underground steam and hot water pipes. The asphaltum packing placed between the shells on the ends of each length and the driven joint makes it watertight. The cut shows the covering before being coated with Montezuma Asphalt.

CATALOG AND PRICES FURNISHED ON REQUEST



TWO ENDS OF WOOD PIPE
Showing tenon and socket joints of Wood Pipe that will stand a pressure of 160 pounds per square inch by simply driving them together.



STEAM PIPE COVERING

YARNALL-WARING COMPANY

Manufacturers of Yarway Steam Specialties
7611 QUEEN ST., CHESTNUT HILL
PHILADELPHIA

BRANCH OFFICES OR REPRESENTATIVES

Atlanta
Boston
Chicago
Cincinnati
Cleveland
Dallas
Denver
Detroit
El Paso
Indianapolis
Kansas City
Minneapolis
Montreal
Syracuse
New Orleans
New York
Pittsburgh
Richmond
St Louis
San Francisco

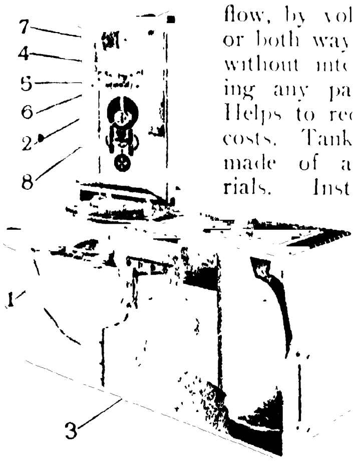
PRODUCTS

- Yarway-Lea V-Notch Recording Liquid Meter
- Yarway Adjustable Spray Head (C. C. Thomas Patents)
- Yarway Seatless Blow-Off Valve
- Yarway Double-Tightening Blow-Off Valve
- Yarway Pipe Joint Clamp
- Yarway Holtite Pipe Clamp
- Yarway Boiler Skimmer
- Yarway Hydraulic Valve (Caskey Patents)
- Yarway Starting and Pressure Unloader (Richards Patents)

YARWAY-LEA V-NOTCH RECORDING LIQUID METER

Measures liquids while they flow, by volume or by weight, or both ways at the same time, without interrupting or retarding any part of the process. Helps to reduce manufacturing costs. Tanks and parts can be made of acid-resisting materials. Instrument may be equipped with a recording thermometer. Accurate within 1½% at all rates of flow. Widely used in manufacturing processes of many industries, among which are:

Acid Manufacturers
Manufacturing Chemists
Dye Manufacturers
Cyanide Mills
Oil Blenders
Paper Pulp Mills
Paint Factories
Explosive Manufacturers
Manufacturers of Butter Substitutes
Cornstarch Products
Toilet Preparations

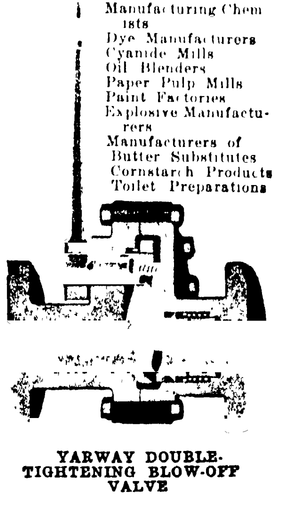


YARWAY-LEA RECORDING LIQUID METER

Operation—Float 1 raises or lowers rackrod 2, indicating on scale 4 height of liquid flowing over V-Notch 3 Drum 5 connected by pinion 6 with rackrod 2 indicates rate of flow at any moment in pounds or gallons per hour. 24-hour chart 7 records flow graphically. Cumulative readings are shown by integrator 8.

The Yarway-Lea V-Notch Meter has long been recognized as a standard for measurement of boiler feed-water. Thousands are in use in all parts of the world.

Send for Bulletin L-40, which gives complete details.



YARWAY DOUBLE-TIGHTENING BLOW-OFF VALVE

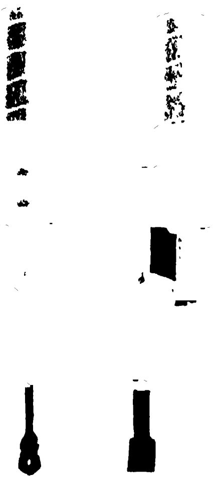
YARWAY ADJUSTABLE SPRAY HEAD (C. C. Thomas Patents)

A simple, efficient spray head for use on cooling ponds, or wherever a liquid must be cooled rapidly.

The **only** spray head that is adjustable to any rate of flow or pressure, and to varying atmospheric and temperature conditions.

Can be flushed clean by operating levers from shore.

Many successful installations throughout the world.

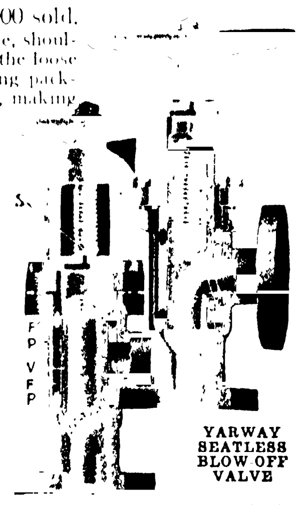


YARWAY ADJUSTABLE SPRAY HEAD

YARWAY SEATLESS BLOW-OFF VALVE

No seat to leak. No discs to wear out. Packing is stationary in body, is never exposed to force of blow-down, and is automatically tightened by closing hand wheel down hard. Slow opening—no danger of water-hammer. More than 20,000 sold.

Operation In closing valve, shoulder S on plunger V engages the loose follower gland F, compressing packing P above and below port, making an absolutely tight valve.



YARWAY SEATLESS BLOW OFF VALVE

OTHER YARWAY PRODUCTS

Yarway Double Tightening Blow-Off Valve—A quick-opening valve with unique feature of sealing bushing on inlet side, making it double tightening on both sides of gate. Particularly adapted for use in tandem with Yarway Seatless Blow-Off Valve.

Yarway Pipe Joint Clamp—Permanently stops leaks at threaded pipe joints.

Yarway Holtite Pipe Clamp—Stops holes and splits in straight pipe.

Yarway Boiler Skimmer—A continuous, circulating surface blow, which prevents scale formation by continuously and automatically removing suspended foreign matter.

Yarway Hydraulic Valve (Caskey Patents)—A quick-acting pressure-packed valve for heavy duty.

Yarway Starting and Pressure Unloader (Richards Patents)—Increases efficiency and lowers current consumption of motor-driven air compressors. Prevents excessive temperature.

Prices and Details of Any Yarway Product on Request.

YORK MANUFACTURING CO.

Ice Making and Refrigerating Machinery Exclusively

MAIN OFFICE AND WORKS

YORK, PA.

BRANCH OFFICES

Boston, Mass., 88 Broad Street
Brooklyn, N. Y., 53rd Street and Second Avenue
Philadelphia, Pa., [illegible] Arch Street
Pittsburgh, Pa., 17 Terminal Way, S. S.
Cleveland, Ohio, [illegible] Woodland Avenue
Atlanta, Ga., 116-18 Central Avenue
Chicago, Ill., [illegible] Cornelia Avenue
Omaha, Nebr., 1213-17 Jackson Street
St. Louis, Mo., 117-19 South 11th Street
Denver, Colo., 2121-31 Market Street
Houston, Tex., 2301 Texas Avenue
New Orleans, La., 619 Baronne Street
Los Angeles, Cal., 408 Boyd Street
San Francisco, Cal., 832-38 Folsom Street
Seattle, Wash., 508 Terry Avenue North
Toronto, Can., Canadian Ice Machine Co., Ltd., Villiers & Munition Sts.

PRODUCTS

Compression Refrigerating Machines, Absorption Refrigerating Machines, Ice Making Plants, Refrigerating Plants, Ammonia Valves, Acid Valves, Ammonia Fittings, Ammonia Condensers, Brine Coolers, Aqua Ammonia Pumps, Ice Cans, and all parts needed to equip a complete ice making or refrigerating plant.

DESCRIPTION

We make, in our own factory, all the machinery and apparatus used in ice making and for general refrigeration, confining ourselves to the ammonia system, both compression and absorption types, and the CO_2 system.

SIZES

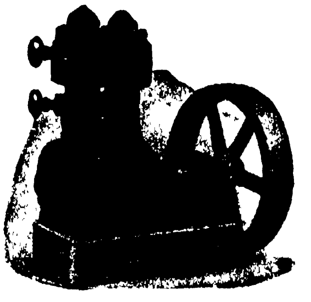
The enclosed machine is built in sizes from ⅛-ton refrigerating capacity upwards, the vertical single-acting machines from 20 to 600 tons, the horizontal double acting machines from 10 to 600 tons either belt or steam driven type. Ammonia Absorption and Carbonic Anhydride (CO_2) machinery of any capacity required by the trade.

APPLICATION

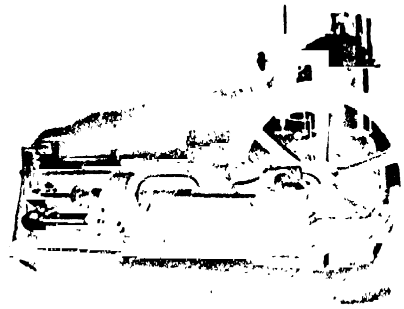
York Refrigerating Machines are adapted for use in Chemical Industries where low temperatures are required, the type of machine being determined, to a great extent, by local conditions.

ACID VALVES

We make a thoroughly reliable Valve for use on Acid Piping—either Globe or Angle Style. In writing for prices state the nature of the acid and pressure to be carried.

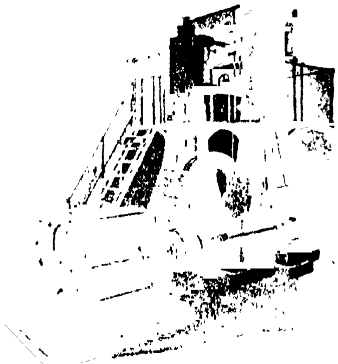


VERTICAL SINGLE-ACTING ENCLOSED REFRIGERATING MACHINE



ENCLOSED SINGLE-ACTING REFRIGERATING MACHINE
Direct connected to Uniflow engine

Mechanical Refrigeration is our specialty. We do not claim to know all there is to be known or learned about this important subject, but what we do know we are willing to share with those who ask. If interested, put your problems up to our Engineering Department.



STANDARD VERTICAL SINGLE-ACTING REFRIGERATING MACHINE
Direct connected to Uniflow engine

REFERENCES

A few York installations in the Chemical Field.
Eastman Kodak Co., Rochester, N. Y.
National Aniline & Chemical Co., Marcus Hook, Pa.
Niagara Alkali Co., Niagara Falls, N. Y.
Mathieson Alkali Co., Saltville, Va.
E. I. Du Pont De Nemours & Co., Wilmington, Del.
General Chemical Co., Easton, Pa.
Atmospheric Nitrogen Corp., Solvay, N. Y.
Oldbury Electro-Chemical Co., Niagara Falls, N. Y.
Monsanto Chemical Works, St. Louis, Mo.
Parke-Davis & Co., Detroit, Mich.
Grasselli Chemical Co., Grasselli, N. J.
U. S. Government Nitrate Plant, Sheffield, Ala.

ZAREMBA COMPANY

508 Niagara Life Building
BUFFALO, U. S. A.
NEW YORK OFFICE: 95 Liberty St.

PRODUCTS

- Horizontal Tube Evaporators
- Zaremba Patent Evaporators
- High Concentration Evaporators
- Rapid Circulation Evaporators
- Vertical Tube Evaporators
- Crystallizing Evaporators
- Hughes Foam Arrester
- Condensers
- Autoclaves and Leaching Cells
- Causticizing Apparatus

ZAREMBA EVAPORATORS

Zaremba Evaporators are built for all classes of work other than the concentration of the heavy acids The various sizes made represent capacities ranging from 150 to 15,000 gallons per hour By having radically different types of construction from which to choose we can provide apparatus suited to any conditions that may obtain

Zaremba Company has specialized in the construction of evaporators since the beginning of its career The excellence of our apparatus is attested by the volume of repeat orders over sixty per cent

Zaremba Evaporators are in use throughout the United States and in all countries of the globe "By their works you shall know them " Look up our record and remember that what we have done for others we can do for you

THE ZAREMBA PATENT EVAPORATOR

The design of this Evaporator is the result of long experience in every class of evaporator work and provides an all round excellence that cannot be secured otherwise

The bodies are of cylindrical shape fitted with removable horizontal tubes secured in position by elastic gaskets and bolted packing plates

Advantages *Maximum Work and Efficiency* is obtained from the steam because of

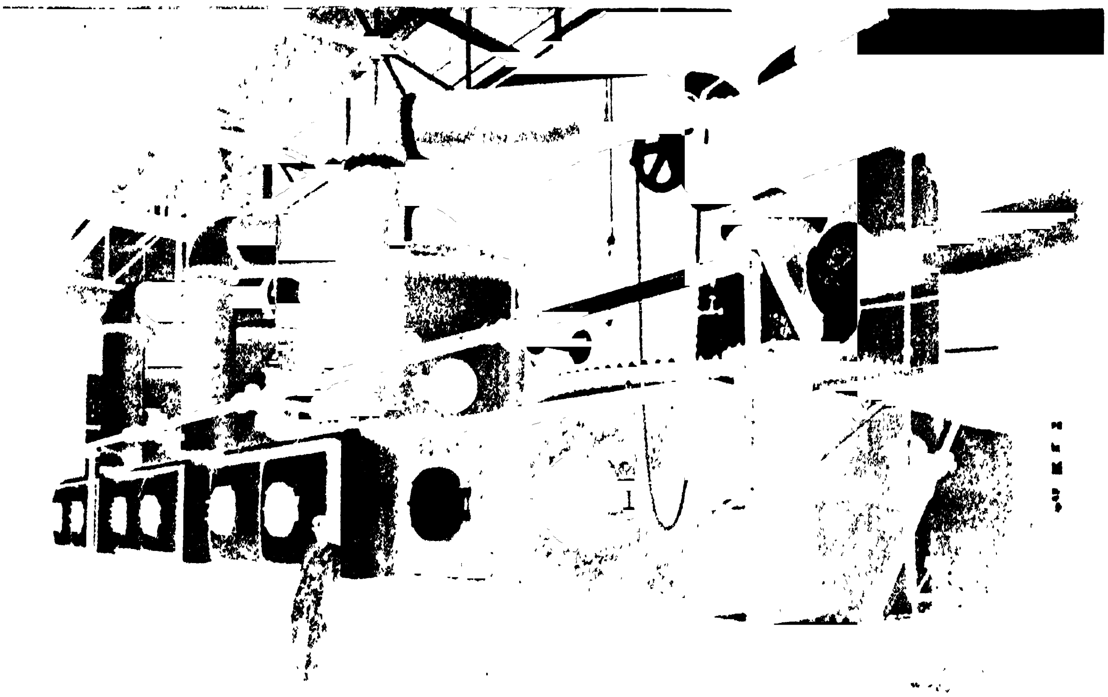
- Rapid circulation of steam through tubes
- Rapid circulation of liquor around the tubes
- Complete venting of air and non condensable gases
- No heat lost except by radiation, giving high efficiency

Liquor is discharged as wanted without injury or loss, because of

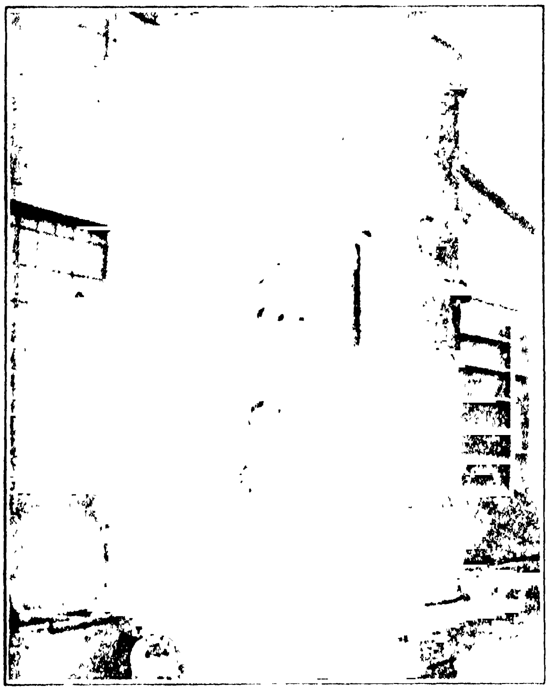
- Low depth of liquor
- Prevention of loss by entrainment
- Ability to deliver product of high and uniform density

Operative Features are extremely economical because of

- Perfect illumination of bodies
- Ease of operation by cheap labor
- Uniform and strong scouring action on tubes
- Ready accessibility to all parts of evaporator for cleaning
- Economical operation at reduced capacity



ZAREMBA PATENT QUADRUPLE EFFECT FOR SULPHITE WASTE



HORIZONTAL TUBE FINISHING PAN

Insurance Against Evaporator Trouble provided because of –

Simplicity of construction no moving parts

Ability to stand accidental internal pressure

Tubes easily removable by unskilled labor

Minimum number of joints, eliminating leakage

Ability to work under pressure no special bracing used

Compact design prevents breakage from settling foundations

Each of the claims we make above has its special significance for the owner and can be readily verified by an analysis of our method of construction

THE ZAREMBA HIGH CONCENTRATOR

Provides means for carrying the concentration of liquids to a point far beyond the possibilities of all other evaporating apparatus Heretofore the limit for caustic soda has been 45 to 50% solids, but by using this apparatus concentration can be continued readily to a content of 80%, solidifying on cooling

Advantages Save cost of firing pots

Reduce wear to a minimum, because of low temperature used

Save freights on finished product by reducing water content to a minimum

Increase capacity of present evaporator by discharging its liquor at lower density

Increase capacity of dryers in old plants.

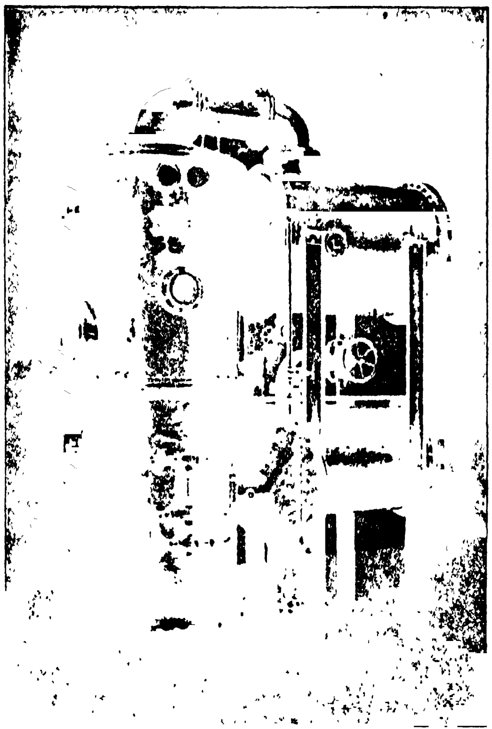
Reduce investment in dryers in new plants.

Where incineration is to take place, increase combustibility by reducing amount of water left in the liquor.

THE ZAREMBA HIGH SPEED EVAPORATOR

Operates on the film system, and is designed for the concentration of liquids that tend to foam badly, for liquids demanding frequent mechanical cleaning of the tubes, for liquids that must be concentrated with minimum exposure to heat

The heating surface is carried in the lower projecting chamber, consisting of horizontal tubes Steam is outside the tubes, boiling liquid and vapor inside. Operation is practically automatic, due to the use of a highly efficient liquor-level regulator



HIGH SPEED EVAPORATOR

Advantages—Amount of liquid exposed to heating surface reduced to minimum

Boiling surface is eliminated (all boiling occurs within the tubes)

All tubes accessible for cleaning by removing steam-chest cover

Construction of utmost simplicity.

Design exceedingly compact, requiring little space

HUGHES FOAM ARRESTER AND CENTRIFUGAL SEPARATOR

(Patent Applied For)

This recently perfected device effectively prevents loss by entrainment, splashing or foaming It is the only separator which will arrest foam, consolidate it into liquid form and return to evaporator.

This device, used on evaporators concentrating foaming liquors, will also increase their capacity by making it possible to operate at full speed.

We are prepared to furnish centrifugal separators for use with existing evaporators of any make.

Continued on Next Page

THE ZAREMBA CRYSTALLIZING EVAPORATOR

Is a form of apparatus especially designed for the concentration of crystallizing solutions and the removal of the precipitated crystals without interfering with the process of evaporation.

Bodies are of cast iron, steel or copper. Tubes are of 2" charcoal iron or copper in vertical position, expanded into tube sheets. Steamchests are of the basket type and being independent of evaporator body and can be removed for replacement and repair.

Advantages in Operation. Steam distribution in steamchests remarkably even, giving uniform ebullition over entire boiling surface. Every tube is in action all the time.

Entrainment losses prevented by the use of short tubes and efficient internal separators.

Interior of bodies perfectly visible, no excuse for careless operation.

High speed of liquor inside tubes retards incrustation.

Rapid separation of crystals from liquor secured by use of extra large downtakes and positive filter-press action at filter screens.

Salt discharged from filters thoroughly washed.

No centrifugals needed, thus greatly reducing cost of plant and cost of operation.

Advantages in Design. Vapor piping arranged to isolate any one body for purpose of cleaning or repair.

Steamchests and connecting piping arranged to eliminate expansion strains, preventing leakage in steam and drain connections.

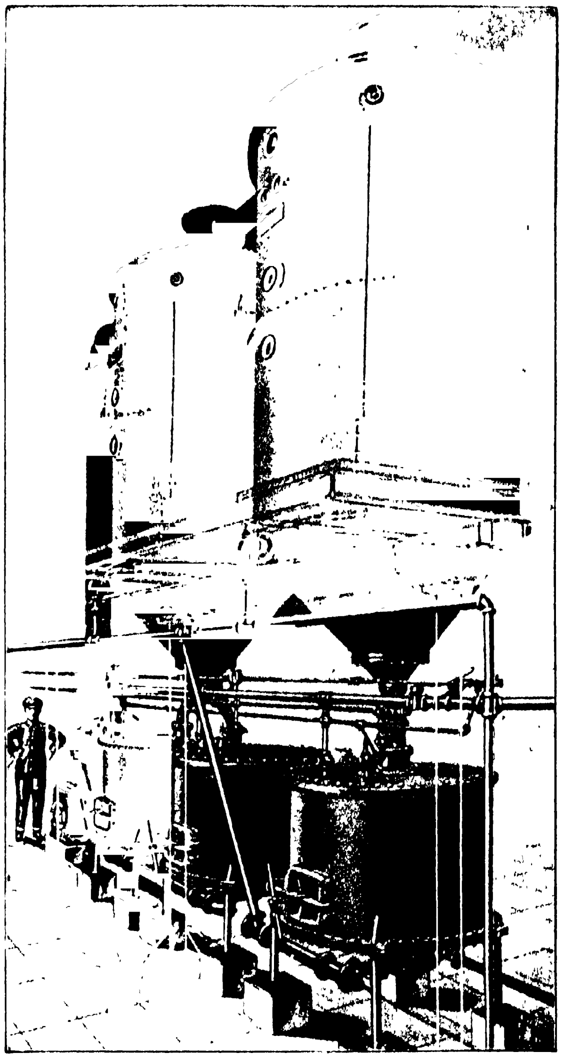
Tubes can be readily replaced.

Number of joints reduced to a minimum.

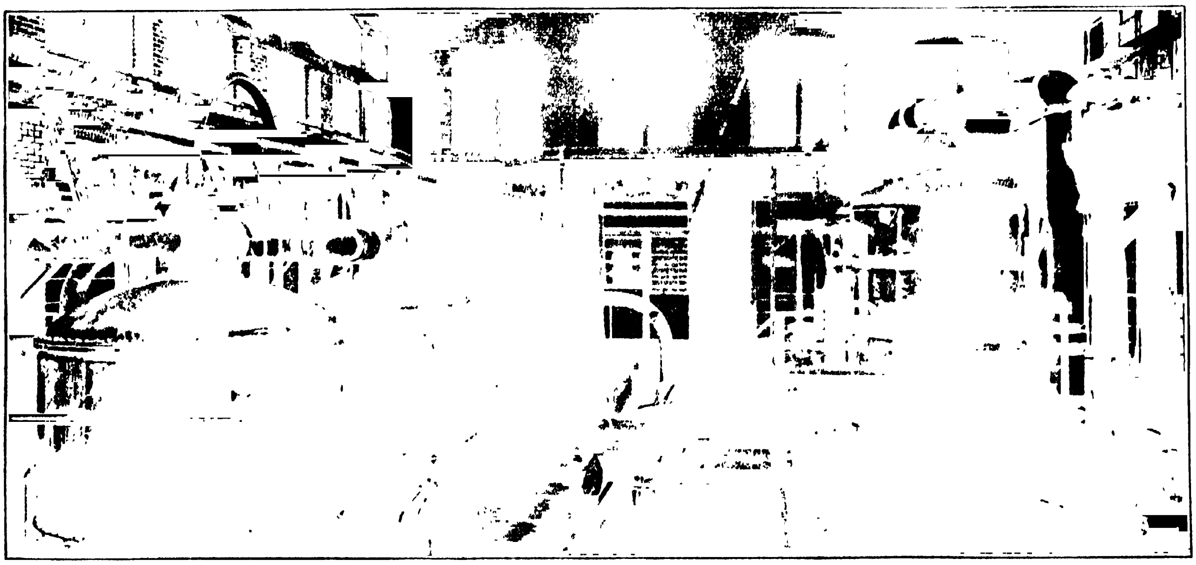
High pressures can be used with safety.

Steamchests can be removed easily and replaced.

Every feature fully worked out in practice.



DOUBLE-EFFECT CRYSTALLIZER



THE ZAREMBA CRYSTALLIZING EVAPORATOR

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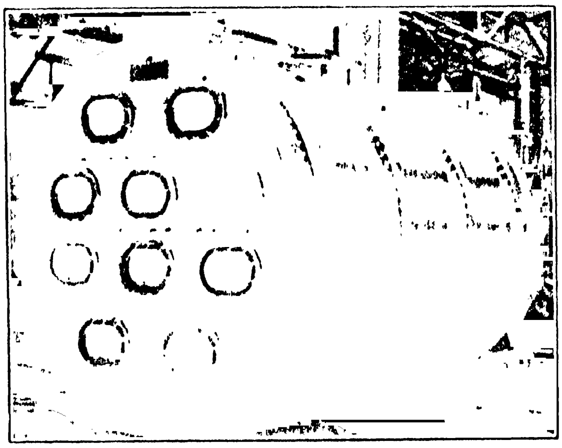
SURFACE CONDENSERS

Carefully designed to produce maximum heat transmission and effective air removal Tubes are removable, being secured in place by rubber gaskets and bolted packing plates



SURFACE CONDENSER

PREHEATERS

When properly designed produce noticeable economy in steam We have given this branch of the business much study You should investigate.

AUTOCLAVES, LEACHING CELLS, AND DIFFUSION BATTERIES

For the extraction of soluble compounds from solids, such as tanning extract from wood chips, soda from black ash, sugar juice from beets

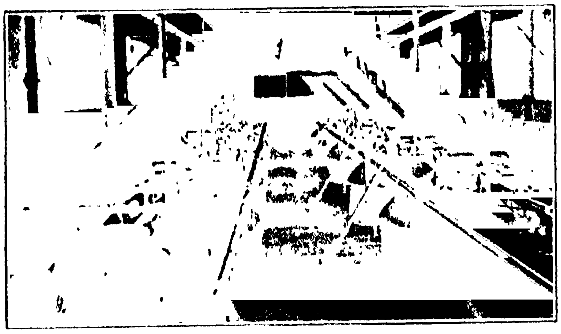


ILLUSTRATION SHOWS OPERATING DECK OF TWO 6-CELL BATTERIES FOR TANNING EXTRACT. CELLS ARE MADE OF STEEL WITH ACID PROOF TILE LINING

ACID PROOF LININGS

Our system of acid proof linings, applied to iron or steel evaporator bodies, has proven itself a valuable and successful invention By its use the cost of apparatus for concentrating liquors in acid condition is greatly reduced

No difficulty is experienced in maintaining the linings intact The method of construction is such that the linings must stay put.

OUTSTANDING ACHIEVEMENTS

The largest Evaporator Plant in the United States and probably in the world, capacity 800,000 gallons per day, at Hopewell, Va

The largest Electrolytic Caustic Evaporator Plant in the world, capacity 110 tons caustic per day, at Edgewood Arsenal.

The only thoroughly practical evaporator system for handling the tarry liquor produced in the distillation of hard wood

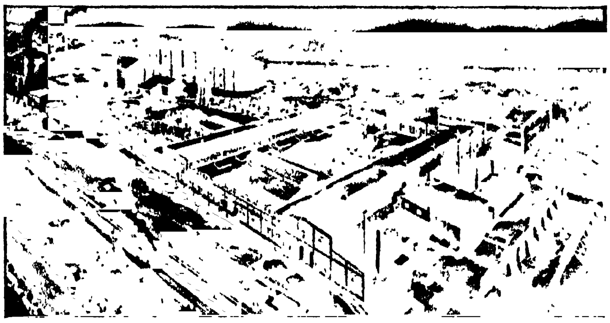
The Hughes Foam Arrester, whereby it is possible to operate an evaporator to full capacity when handling excessively foamy liquors, such as jack pine black liquor

A system of lining evaporators that is absolutely reliable

The Zaremba Patent Evaporator, known throughout the country as being the simplest in construction and the most dependable in operation.

MANUFACTURING FACILITIES

The success of Zaremba Company is in part due to the excellence of mechanical execution of its output. All our apparatus is built in thoroughly equipped shops prepared to handle work of the largest size The high grade of castings that we furnish is a matter of frequent comment.



VIEW OF PLANT

In addition to our cast iron work, we do a large amount of construction in steel plate and in copper.

During the past eleven years we have made over 300 installations (comprising 600 evaporator bodies), many being of the largest size The excellence of our work is attested by the volume of repeat orders, being over 60%.

INQUIRIES

In submitting an evaporator problem to us, the conditions should be stated as completely as possible, since many considerations enter into the choice and layout of proper equipment.

Chemicals and Materials Section

Comprising catalog data of leading manufacturers of Heavy and Fine Chemicals, Reagents, Alcohols, Solvents, Dyestuffs, Dry Colors, Adhesives, Starches, Soaps, Sizings, Alloys, Raw Materials and Supplies used in the various industries to which the Chemical Engineering Catalog is distributed. Also of important handlers of Oils, Gums, Waxes, Ores, Rare Minerals, and other substances not marketed by manufacturers, and therefore admissible to this Section under the names of responsible dealers.

Space in the Chemicals and Materials Section *is available only to manufacturers or their exclusive sales agents*, except in such lines as those last mentioned above, to which this regulation naturally does not apply. The restriction] of this Section of the Catalog to *first hands exclusively* in manufacturing lines indicates the plane on which the work is conducted, and the character of the service rendered to the responsible, established makers of these commodities who are alone entitled to use space in the volume.

Direct and Constant Contact with the Chemicals and Materials Market

More than eleven thousand copies of the Chemical Engineering Catalog are in the hands of the individuals who *actually buy and specify the materials used* in the industries employing chemical processes of manufacture, prominent among which are the following:

Pulp and Paper
Sugar
Soap
Leather
Rubber
Paint and Varnish
Fertilizer
Textiles
Cement
Paving Materials
Dyestuffs
Explosives
Celluloid and other Plastics
Storage Batteries
Linoleum and Oilcloth
Photographic Materials
Petroleum Products
Foodstuffs
Glass and Pottery
Drugs
Perfumes
Illuminating Gas
Flavoring Extracts
Tanning Extracts
Fruit Juices and Syrups
Disinfectants
Artificial Silk
Glue and Adhesives

As an adjunct service of great value, every space user receives a printed Distribution List giving the names of the firms and individuals in whose hands copies of the Catalog are placed. This List, revised and brought up to date annually, is furnished exclusively to the users of catalog space in the volume, and is *not for sale* at any price.

In addition to the Distribution List, space users in the Catalog are furnished with a Bulletin Service, which gives advance news regarding new enterprises and manufacturing changes and additions. This news comes direct to our Information Bureau and is, in most instances, exclusive information and profitable to our space users. The Bulletins are issued at irregular intervals, usually about every two weeks.

ALBANY CHEMICAL COMPANY

Established 1881

Cable Address
"KETONES", Albany, N. Y.
All Codes

Manufacturing Chemists

Importers, Manufacturers' Agents, Exporters

2-24 BROADWAY, ALBANY, N. Y.

NEW YORK OFFICE 108 JOHN STREET

FACTORIES
Albany, N. Y.

SOLE SELLING AGENTS FOR

QUINN LABORATORIES, INC.
OLEAN, N. Y.
Manufacturers of
Wood Creosote U. S. P.
and Allied Products

PENN FORMALDEHYDE MFG. CO., INC.
EAST SMETHPORT, PA.
Manufacturers of
Formaldehyde
and its By Products

THE EBOLITE COMPANY, INC.
ALBANY, N. Y.
Manufacturers of
Substitutes for
Horn, Ivory, Amber, etc.

PRODUCTS

- Chemicals
- Solvents
- Pharmaceuticals

CHEMICALS AND SOLVENTS

- Acetanilide, Technical
- Acetic Anhydride, 85% and 90%
- Acetone, C P.
- Acetone Oil, Light
- Acetone Oil, Heavy
- Acid Acetic, All Grades
- Acid Citric, U S P
- Acid Formic; 75, 85, 90%
- Acid Oxalic
- Acid Tartaric, U S P.
- Ammonia, Aqua, 26° Bé.
- Amyl Acetate
- Aniline Oil
- Aniline Salt
- Chloroform, U.S.P.
- Collodion, Special Technical
- Collodion, Stripping
- Ether Sulphuric, U S P 1910
- Ethyl Acetate, Technical
- Ethylmethyl Ketone
- Formaldehyde, U S P 40%
- Fusel Oil, Refined (Amyl Alcohol)
- Iron Chloride Solution, Neutral
- Paraformaldehyde
- Solvent "T"
- Solvent "M"

DYEWOOD EXTRACTS

- Fustic, Extract
- Fustic, Solid
- Hematine, Crystals
- Hematine, Paste
- Logwood, Crystals
- Logwood, Extract Solid
- Logwood, Extract Liquid 51°

SULPHONATED OILS

- Excelsior Oil
- Turkey Red Oil

PHARMACEUTICALS

- Acetanilide, U S P.
- Acid Acetylsalicylic
- Acid Carbolic, Crystals, U S P
- Acid Citric, U S P.
- Acid Salicylic, U S P.
- Ammonium Iodide, U S P.
- Ammonium Citrate
- Ammonium Sulphocarbolate, U S P.
- Ammonium Salicylate, U S P
- Cadmium Bromide
- Caffeine Citrated, U S P.
- Calcium Sulphocarbolate
- Chloroform, U S P For Anesthesia
- Collodion, U S P.
- Collodion, U S P 1890
- Collodion, U S P. Flexible
- Cream of Tartar, U S P.
- Creosote, U S P
- Creosote Carbonate, U S P
- Cresolis Liquor Compositus
- Ether, Acetic, U S P
- Ether, Nitrous, Conc., 1 21
- Ether, Sulphuric, U S P. For Anesthesia
- Ether, Sulphuric, Washed
- Guaiacol Carbonate, U S P
- Hexamethylenetetramine, U.S P.
- Hydrogen Peroxide, U S P
- Iodine, U S.P., Resublimed
- Iodine Tincture
- Iodoform, U S P., Powder and Crystals
- Iron Chloride Crystals, U.S P.
- Iron Citrate, U S P. VIII (Ferric Citrate)
- Iron Phosphate, U.S P., Scales
- Iron Pyrophosphate, U.S P. VIII, Scales
- Iron Sulphate, U.S P., Crystals
- Iron and Ammonium Citrate, U S P., Brown Scales
- Iron and Ammonium Citrate, U S P., Green Scales
- Iron and Quinine Citrate, Soluble, U.S.P.
- Iron, Quinine and Strychnine Citrate
- Iron and Strychnine Citrate, U.S.P., VIII
- Methyl Salicylate, U S.P.
- Paraformaldehyde
- Potassium Acetate, U S.P.
- Potassium Citrate, U S P.
- Potassium Iodide, U.S.P.
- Salol, U S.P.
- Silver Chloride
- Silver Iodide
- Silver Nitrate, U.S.P.
- Sodium Citrate, U.S.P. VIII
- Sodium Iodide, U.S.P.
- Sodium Salicylate, U.S.P.
- Sodium Sulphocarbolate
- Zinc Sulphocarbolate

ALCOHOL PRODUCTS COMPANY

Independent Manufacturers of
Accetates, Alcohols, Cotton Solutions, Lacquers, Etc
SALES OFFICE
110 WILLIAM STREET, NEW YORK, N. Y.

Cable Address
"ALPRO", New York

ALPRO
Trade-Mark

PLANTS
Newark, N. J.
Sutton, W. Va.
Monmouth Junction, N. J.
Stamford, Vt.

PRODUCTS

- Amyl Acetate
- Butyl Acetate
- Ethyl Acetate
- Methyl Acetate

- Amyl Alcohol
- Butyl Alcohol
- "Di-Al" (Diacetone Alcohol)
- Fusel Oil, Crude

- Soluble Cotton
- Cotton Solutions
- Split Leather Dope
- Approved Airplane Wing Dope

- Lacquers, Wood
- Lacquers, Metal
- Lacquers, Special

- Patent Leather Solutions
- Artificial Leather Solutions

- Special Solvent Thinners

SERVICE

Are you utilizing the services of our Research Department?

Consumers of solvents and cotton solutions will find this Department adequately equipped to satisfactorily cope with their individual problems. Each of these men engaged in the Research Department is an expert in the manufacture and application of solvents and cotton solutions.

Let us assist you in successfully and economically meeting conditions which present themselves from time to time, and work with you in devising, developing, and perfecting formulas and new processes to meet your particular requirements as they may be affected directly or indirectly by buying and selling conditions.

Commencing with the mining of coal at mines which we control, the production of our solvents and cotton solutions is the culmination of a series of successive operations through the various steps involved in the manufacture of intermediates, and finally through to the finished products.

We stop here, however, and consequently are not competing with our customers.

The magnitude of our resources for crude materials from which most of our finished products are made, renders us independent of outside sources for our essential, crude and intermediate materials, assuring our customers of a steady and dependable source of supply.

The Brand **"Alpro"** means quality and service.

Inquiries should be addressed to New York Office.

AMERICAN CYANAMID COMPANY

511 FIFTH AVENUE, NEW YORK, N. Y.

Cable Address
"LIMENITRO", New York
Western Union Code

FACTORIES

Cyanamid Works, Niagara Falls, Canada
Ammo-Phos Works, Warners, N. J.
Phosphate Mines, Brewster, Fla.

PRODUCTS

Crude Cyanamid, Cyanamid, Cyanide, Hydrocyanic Acid (Liquid), Aqua Ammonia, Ammo-Phos, Mono-Ammonium Phosphate, Urea, Thiourea, Dicyandiamid, Florida Pebble Phosphate.

CRUDE CYANAMID

The primary product of fixation of atmospheric nitrogen in calcium carbide at a white heat. From this product Cyanamid fertilizer, cyanide, ammonia, urea, dicyandiamid and a large number of organic nitrogen compounds are produced. It is a bluish black powder containing about 65% actual calcium cyanamid, equivalent to 22 to 24% nitrogen. Shipped usually in special tank cars, or in burlap bags.

CYANAMID

A fertilizer material containing about 21% nitrogen, equivalent to 25% ammonia. Used only in manufacture of mixed fertilizers, at the rate of about 60 pounds per ton of mixture. Particularly useful as a drying agent or conditioner. The contained nitrogen is 97% water soluble, and organic in form.

CYANIDE

An electric furnace cyanide made from crude cyanamid and common salt by simple fusion. Thousands of tons are used annually in the United States, Canada and Mexico for the reduction of gold and silver ores, and also for the manufacture of liquid hydrocyanic acid, prussiates, and metallic cyanides. The lowest priced source of cyanogen or cyanide for any metallurgical or chemical purpose. Thin, porous, dark gray flakes, readily soluble in water. Packed in metal drums containing about 200 pounds, net, each.

HYDROCYANIC ACID (Liquid)

A water-white liquid, very pure, 95/98% HCN. Furnishes the greater part of the hydrocyanic acid used for direct fumigation of citrus fruit trees and vineyards in California. Also may be used for fumigating railroad cars, ships, mills, etc. Boiling-point 79° F. Packed in tin-lined drums, holding about 80 pounds each, net, or in steel cylinders. Shipped by motor truck from nearest point of production.

AQUA AMMONIA

26-degrees Baumé, containing 29.4% ammonia, absolutely free from coal-tar impurities. Made at Ammo-Phos Works, Warners, New Jersey.

AMMO-PHOS

An ammoniated phosphate, used principally as a highly concentrated fertilizer. One grade contains 13% ammonia with 48% available phosphoric acid. Another grade contains 20% ammonia with 20% available phosphoric acid. Each ton contains as much plant food as two to three tons of other high-grade fertilizers, thus saving one-half to two-thirds the cost of freight, bags, handling, etc., on a given amount of plant food. The product is dry, granular, perfectly stable, and over 95% water-soluble. Particularly valuable for export. Packed in burlap bags holding 200 pounds, net, each.

MONO-AMMONIUM PHOSPHATE

Mono-ammonium phosphate ($NH_4H_2PO_4$), technical or chemically pure grades. Used for fireproofing, impregnation of matches, yeast culture, and in baking powders.

UREA

Melting-point 132.65°C. Used as an anti-acid or stabilizer in pyroxylin plastics, such as celluloid, in lacquers, artificial leather, dopes, etc. It is perfectly neutral but reacts with any traces of acid developed by slow decomposition on long standing, thus tending to prolong the life, color and strength of the substance in which it is used.

THIOUREA

$CS:(NH_2)_2$. A new commercial product, melting-point 180° C. Can be produced on large scale. Possibly useful in accelerators for vulcanizing rubber.

DICYANDIAMID

A white crystalline salt. Melting-point 205° C. Formula—$NH:C.NH_2.NHCN$., 66% nitrogen. An organic base for guanidine compounds and possibly several other valuable compounds. Research on this product may uncover some valuable industrial uses. Can be produced at low cost in large quantities.

FLORIDA PEBBLE PHOSPHATE, 68%

Capacity of mines, at Brewster, Florida, over 700,000 tons per annum.

PROCESS RIGHTS

Process rights and basic material (crude cyanamid) for production on large scale of

Aqua Ammonia
Anhydrous Ammonia
Nitric Oxide
Nitric Acid
Ammonium Nitrate

BOOKLETS

Descriptive matter on any or all products sent on request.

POLICY

All Aero Brand products are manufactured on a basis of large scale operation by improved processes, from fundamentally low-costing primary materials. It is the policy of the company to share with consumers the economies resulting from its fundamental processes, in order to encourage the widest possible use of Aero Brand products.

AMERICAN DYEWOOD COMPANY

80 MAIDEN LANE, NEW YORK, N. Y.

Cable Address
"DYEWOOD," New York

BRANCH OFFICES

125 Bourse Building, Philadelphia, Pa
115 High Street, Boston Mass
516 Spectator Building, Hamilton, Ont.

PRODUCTS

Dyewood Extracts for dyeing and coloring wool, cotton, silk, leather, wood, paper, and other materials.

LOGWOOD EXTRACTS

Liquid, Solid and Crystals.

HEMATINE

Paste and Crystals.

FUSTIC EXTRACTS

Liquid, Solid and Crystals.

HYPERNIC, LIMAWOOD AND REDWOOD EXTRACTS

Liquid, Solid and Crystals.

GROUND AND CHIPPED DYEWOODS

Including Logwood, Fustic, Hypernic, Limawood, Camwood, Barwood and Red Sanders

EXTRACT QUERCITRON BARK

OSAGE ORANGE EXTRACT

YOUNG FUSTIC CRYSTALS

CUTCH EXTRACT

GAMBIER PASTE

GROUND TARTAR

GROUND TURMERIC

We also handle extensively:

NATURAL INDIGO

EXTRACT SUMAC

Liquid and Crystals.

ARCHIL

EXTRACT OF INDIGO

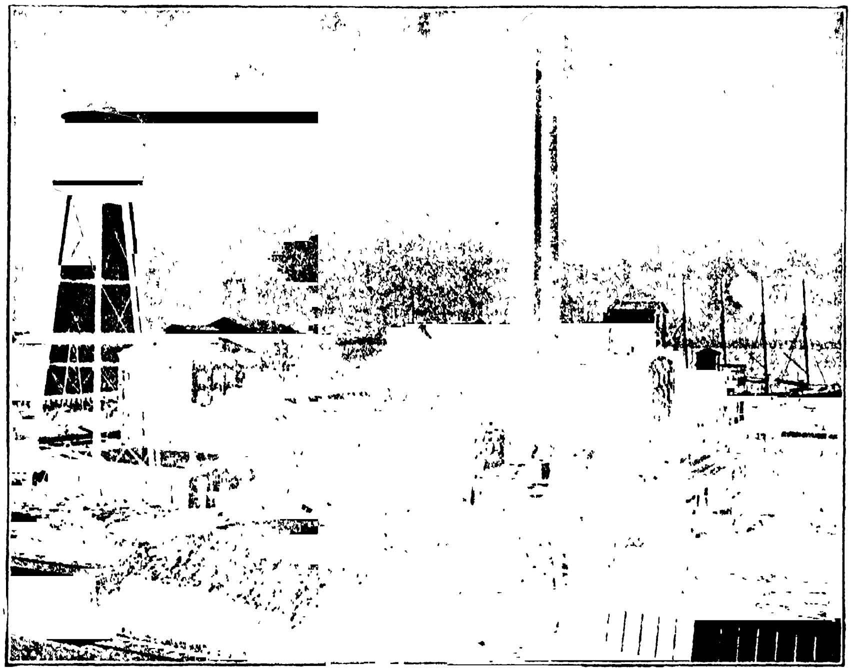
COLORS AND CHEMICALS

HISTORY

A continuous business since the year 1798.

Over a century ago our original predecessors established this business, laying a firm foundation of service and quality that has endured.

From an original beginning at Greenwich Village in 1798, where the power was furnished by a horse walking around a capstan, and the very smallest production, the Company gradually developed, until the establishment was moved to Greenpoint, Brooklyn, where the business was incorporated as the New York Dyewood Extract & Chemical Company, succeeded by the New York & Boston Dyewood Company, which, by consolidation with the Sharpless Dyewood Extract Company of Pennsylvania, in 1904, created the present Company, whose plant is now situated at Chester, Pa., with an output capacity of some 65,000 tons per year, thus making it the largest individual dyewood mill in the world.



WORKS AT CHESTER, PA.

AMERICAN MINERAL PRODUCTS & COLOR CO., LTD.

NOBELSTOWN (NEAR PITTSBURGH), PA.

PRODUCTS

Sun Oxide of Iron, Prepared Mineral Oxide-Sponge; Non-Carbonaceous and Fireproof Mineral Sponge—the perfect Fluffing Material; Basic Ferric Sulphate, a fertilizer.

SUN OXIDE OF IRON

This product is used as the absorption medium in the purification of city gas during manufacture.

The method of use consists in uniformly mixing this oxide of iron with granulated blast furnace slag, the latter acting as a fluffing material or "body" for the oxide. Sufficient water is added to this mixture to produce a colloidal mass. The whole is then loaded into the gas-boxes as in present practice in gas works, and the gas filtered to free it from sulphur.

The advantages attendant upon using such a fluffing material are many, such as: Greater purifying capacity, reduction in cost of purifying gas. It is Non-Combustible.

The sulphur from the purified gas forms sulphur pyrites with components of the slag.

OTHER OXIDES OF IRON

Other Oxides of Iron are made by us for paints, rubber, linoleum, wall-paper, and similar requirements; also a brilliant red, known as "high oxide," equal to the best imported English Oxide for every use to which the latter is put.

BASIC FERRIC SULPHATE $Fe_4O\ (SO_4)_5$

This product recovered from flue dust as a by-product is refined by us and is an excellent fertilizer. The analysis is as follows

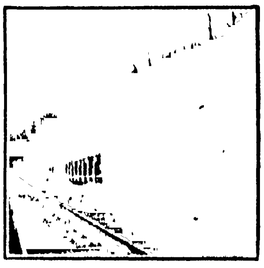
Basic Ferric Sulphate	41.55
Ca O	21.83
P	0.070
$Si\ O_2$	19.45
Moisture (at 100% C)	5.97
Combined H_2O	5.77
Sulphuric Acid	.98
Aluminum	6.05
	101.67

ABSORPTION TEST OF SUN OXIDE OF IRON BY THE KUNBERGER METHOD USED BY THE U. G. I.

Sample moistened before fouling figured dry

Mar 13th,	First fouling	26.7	per cent
" 15th,	Second fouling	20.0	"
" 17th,	Moisture added		
" 18th,	Third fouling	22.3	"
" 20th,	Fourth fouling	20.0	"
" 22nd,	Moisture added		
" 25th,	Fifth fouling	24.9	"
" 27th,	Sixth fouling	16.7	"
Mar 31st,	Moisture added		
April 1st,	Seventh fouling	13.1	"
	Sample removed from tube moistened occasionally and allowed to dry in the air		
April 16th,	Eighth fouling	21.0	"
" 17th,	Moisture added		
" 19th	Ninth fouling	26.0	"
" 23rd,	Tenth fouling	26.2	"
" 24th,	Removed from tube moistened and aired		
" 25th,	Eleventh fouling	24.6	"
" 28th,	Twelfth fouling	24.4	"
" 29th,	Removed from tube moistened and aired		
" 30th,	Thirteenth fouling	24.4	"
May 2nd,	Fourteenth fouling	24.6	"
" 5th	Fifteenth fouling	25.6	"
" 16th,	Sixteenth fouling	26.7	"
" 23rd,	Seventeenth fouling	23.1	"
" 27th	Eighteenth fouling	22.5	"
" 28th,	Removed from tube, moistened and aired		
June 1st	Nineteenth fouling	22.1	"
" 11th,	Twentieth fouling	21.8	"
	Total	456.7	"

OXIDE OF IRON DEPOSIT 20 FT. THICK

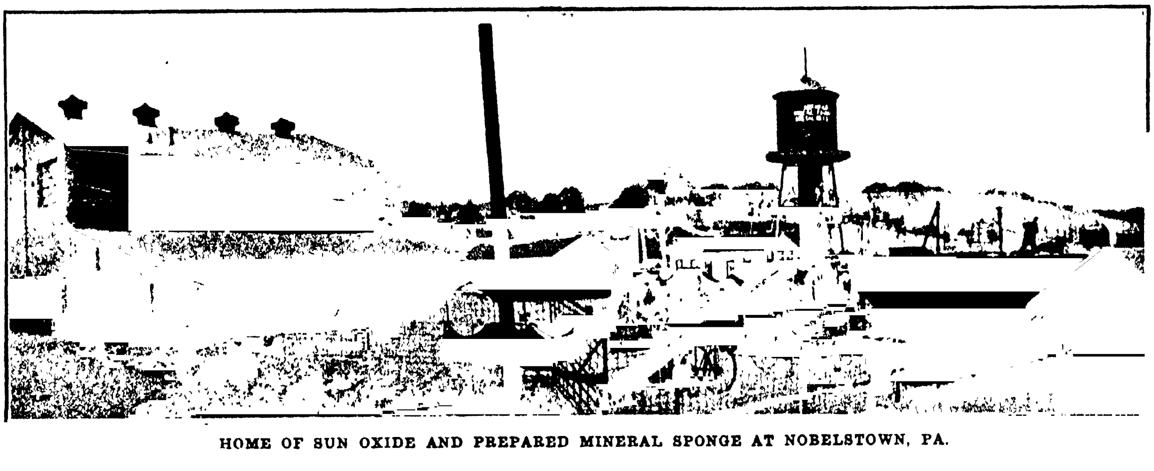


LOADING TIPPLE AT SUN OXIDE PLANT

"GRANULATED" SLAG USED FOR WATER PURIFICATION TO PREVENT STREAM POLLUTION

This slag is made by a process patented by us. It is when finished a brittle, pumice-like mass. It has substantially all its original lime content. It is used to form a filter bed, through which coal mine water containing acids is run. In neutralizing a hydrated sesqui-oxide of iron is formed.

The spent slag is excellent as a fertilizer, for purifying gas, and for paint manufacture.



HOME OF SUN OXIDE AND PREPARED MINERAL SPONGE AT NOBELSTOWN, PA.

AMERICAN STEEL & WIRE COMPANY

CHICAGO, ILL. NEW YORK, N. Y. CLEVELAND, O.
PITTSBURGH, PA. DENVER, COLO.

EXPORT REPRESENTATIVE
U. S. STEEL PRODUCTS CO., 30 CHURCH ST., NEW YORK, N. Y.
Cable Address: "STEELMAKER", New York
PACIFIC COAST REPRESENTATIVE
U. S. STEEL PRODUCTS CO.
San Francisco, Calif. **Los Angeles, Calif.** Portland, Ore **Seattle, Wash.**

PRODUCT

American Sulphate of Iron

Sugar Form Prime Green Crystal

AMERICAN SULPHATE OF IRON

With us this is a by-product of quality, and the word quality used here has a deep significance.

Through a period of years there has been an evolution in the processes of production. We have the largest equipment to turn out the greatest quantity and the best quality obtainable, free from excess acid and moisture, and of uniform composition.

Several of the applications of Sulphate of Iron are:

1. **Water Purification:** As a coagulant.
2. **Red oxide production,** by burning
    - a. To produce colors and pigments
    - b. For plate glass polishing
    - c For jewelers' rouge
3. **Prussiate of Soda,** obtained from iron cyanides produced as a cyanogen by-product of gas-plants and coke-ovens
4 **Gas Purification,** to make hydrated iron oxide for use in purifying boxes of gas plants.
5 **Prussian Blues,** by combination with prussiate of soda and acids, subsequently used to produce,
    - a Blue pigments.
    - b. Printing ink
    - c Bluing
6. As a mordant,
    - a In dyeing with natural wood dyes on silk, wool, cotton and leather
    - b. In paper and cardboard manufacture
7 Recrystallized chemically pure Sulphate of Iron, useful in the following lines.
    - a. Fur dyeing
    - b. Photographic work
    - c Analytical chemistry
8 Concentrated tankage, setting the "stick" from the liquor.
9 Fertilizer ingredient
10. Radium and vanadium production, in concentration of rare earths
11. Precipitating gold in jewelers' industry.
12 Stock foods and disinfectants
13 Drugs and medicines
14. Weed eradication and horticultural purposes
15 Hog conditioner and prophylactic of hog cholera.
16. Deodorizer in farm and camp sanitation

These may suggest to you a use that you can make of Sulphate of Iron.

On request a sample will be furnished with which you can experiment or determine its analysis.

Hitherto you may have known this product as Copperas and may have given no serious consideration to its use in your work. However the fairly comprehensive list of its applications will now indicate to you the variety of industries in which American Sulphate of Iron is used.

The progress of "Made in America" chemicals has been remarkable. We have kept step in this march onward and are prepared to serve this quality product.

SPECIFICATIONS

Ferrous sulphate, Green vitriol, Copperas.
$FeSO_4 7H_2O$.

Color and properties—Pale bluish-green crystals of various sizes and shapes; efflorescing in air; saline, astringent taste.

Physical constants—Molecular weight 278; specific gravity 1.8987 (15° C.); melting-point: Dissolves in its water of crystallization at 64° C.; loses its water of crystallization entirely at 300° C., of $6H_2O$ at 100° C.

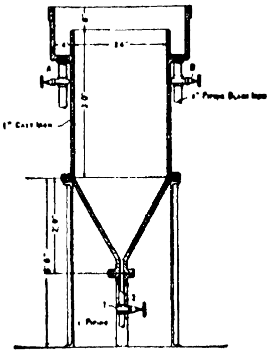
Solubility—Parts in 100 of water:
At 0° C. 32.8; at 60° C. 263.
Insoluble in alcohol.

Grades—(a) Prime Green Sulphate (Selects or Stick crystals) is the commercial Sulphate in crystals of relatively large size. It results from the natural process of crystallization. Where this grade is desired, we use care in selecting only crystals of prime quality.

(b) Seconds (Bottoms) is a somewhat poorer quality of mixed crystals, sometimes termed "Rusty."

(c) Sugar Sulphate is the newer form of Sulphate of Iron in which we specialize. It is produced in crystals of uniform size resembling coarse grained granulated sugar. Its Anhydrous Sulphate content runs approximately 7.36% greater than the Prime Green and 12.18% greater than Seconds, which makes it a more economical purchase where strong iron or acid content is required. It will not agglomerate into lumps if kept in a cool, dry place.

Method of Dissolving Sugar Sulphate of Iron—The proper method for dissolving Sugar Sulphate of Iron is as follows: Place the Sulphate in the dissolving tank such as shown. By opening the valve "2," water is forced upwardly through it, overflowing the vessel at the top and can be conducted away to storage through valves "A" or "B". A saturated solution can be prepared with a single flow and within a few seconds.



DISSOLVING TANK

FORM OF SHIPMENT

Sulphate of Iron is shipped in bulk and in three styles of packages: 200 lb. bags; 100 lb. bags; and barrels weighing approximately 350-400 lb. each.

SERVICES

Our Water Purification, Agricultural, and Sanitary Engineering staffs are always available free, and we shall be glad to have you make the fullest possible use of their knowledge and experience.

AMERICAN TRONA CORPORATION

Borax and Potash Producers

THIRTY-SIXTH FLOOR, WOOLWORTH BLDG., NEW YORK, N. Y.

WESTERN OFFICE Pantages Building, LOS ANGELES, CALIF.

Deposit and Refinery
Trona, Calif

Cable Address
"AMERTRONA", New York

PRODUCTS

Borax
Potash

BORAX

"Three Elephant Brand" Borax, granulated and powdered, is guaranteed to be 99.5% pure

Uses—Borax is used extensively in the ceramic industries, glass, enameled ware, pottery, etc., in metallurgy as a flux; in the textile industry, in tanning for preserving, bleaching and softening leathers, also with hemlock tans. It is also used extensively in medicine; in toilet preparations such as hair washes, tooth pastes, cosmetics, and mouth washes, antiseptics and disinfectants, also as a food preservative.

Shipments—For the convenience of our customers we carry extensive stocks of Borax at convenient trade centers.

Shipments of carload lots in bulk or in bags or barrels can be made immediately from our factory or distributing points.

POTASSIUM CHLORIDE (Muriate of Potash)

"Kemfert" brand of Potassium Salts are produced by us in grades containing from 80% to 98% KCl, or 50% to 62% K_2O.

Analysis—"Kemfert" Potash Salts

$Na_2B_4O_7$	0.47%
$NaHCO_3$ Na_2CO_3	0.52
NaCl	0.58
Na_2SO_4	0.38
KCl	98.10
Total	100.05

Uses—"Kemfert" Potassium Salts are suitable for all Chemical and Fertilizer purposes. Practically all the Caustic Potash produced in the United States during the last two years was manufactured from our Potash Salts. Other important uses are the production of Potassium Chlorate and the manufacture of Dyestuffs.

Shipments—Carload lots in bulk in paper-lined cars, minimum weight 40 tons, can be made immediately. Shipments in bags or barrels in specified sizes can be arranged.

COOPERATION

Our technical staff stands ready at all times to render any assistance desired in connection with the use of our products, to smooth out difficulties, solve problems, and standardize processes.

QUOTATIONS

We shall be pleased to quote promptly on any amount of our products.

SERVICE

Every man in our organization is trained in the knowledge that quick shipments and dependable deliveries are vital factors in the industries we serve. Our location on our own railroad connecting with transcontinental trunk lines means an adequate car supply with quick rail movement to the Middle Atlantic and Southern States. Rigid chemical control insures constant maintenance of quality—a guarantee to our customers of absolutely trustworthy service.

PART OF A SINGLE SHIPMENT OF 32 CARS OF KEMFERT SALTS, AVERAGING 91% KCl

APEX CHEMICAL COMPANY, INC.

Manufacturers of Industrial Chemical Products

Cable Address
"APEXICAL," New York
ABC Code

223 WEST 33RD STREET, NEW YORK, N. Y.
WORKS
200 14 S First St, Elizabethport, N J

BRANCH
775 Drexel Bldg,
Philadelphia, Pa

PRODUCTS

Chemicals for the Textile, Tanning, Rubber, Printing Ink, Fur Dyeing, and Allied Industries.

ANTIMONELLE (Patented)

A fixing agent for basic colors and for the manufacture of fast color lakes. Twice the strength of tartar emetic; produces better results at less cost.

ANTIMONY LACTATE

Both liquid and dry. A fixing agent for basic colors; suitable for textile and leather requirements.

ANTIMONY SULFURET

Crimson and Golden. Applied in the manufacture of rubber.

CALAFENE

A binder for pigments on leather. Assures a fast pigment and pliability. Reduces the cost of pigment solution.

CARSENE

Removes grease and other stains from textile fabrics; prevents "spewing" of leather. Non-inflammable.

CHROMIUM FLUORIDE

Crystal form. Used in printing paste, in wool printing, for fastening the colors. No free mineral acid.

DEPILOMINE

Removes the hair from hides and skins without the liming process. Non-injurious to the hide substance. A two-day process; saves time and labor.

FATOSAN

A highly concentrated, refined fat liquor for leather. Particularly intended for leather that is to be glaze finished. Perfectly soluble and neutral.

FINISHES

For all kinds of silk, silk and cotton mixed, and cotton fabrics. Finishes to meet special requirements.

LACTIC ACID (Commercial)

22%, 44% and 66% strengths. Lightest in color and purest in quality. For tanning of leather and wool dyeing, and other purposes. The 66% strength is recommended because of the saving in freight, cartage and handling, due to its concentrated strength.

LEATHER DRESSINGS

To produce high, medium or dull finishes to leather. Smutproof and flexible. Of special advantage in connection with pigments. Dressings to meet special requirements.

OILS

Modern equipped plant for sulfonating oils.

Turkey Red Oil—All strengths; perfectly soluble.

Ronopole Oil—Similar to Turkey Red Oil but more highly oxidized and possesses superior properties. Better for dyeing and finishing of textiles.

Chlorinol Oil—A solvent oil for scouring wool. Removes mineral oil and other stains and impurities.

Emulsive Oil—For softening raw silk prior to winding. Imparts "body" to the raw silk, because of its high specific gravity. Will not affect the gum or silk fiber.

Lubricating Oil—For "lubricating" or softening artificial silk yarn intended for knitting purposes. Readily removed in the dyeing process; eliminates streaky or uneven dyeing.

Yolk Oil—For treating fur pelts after dyeing, in place of egg yolk. Imparts a soft, velvety effect and nourishes the pelt; will not affect the pelt. One pound displaces ten pounds of egg yolk, thus assuring a lower cost.

ORTHOPHENE BATE

A chemical bate for deliming hides and skins; leaves the stock soft and clean, in the best condition for the subsequent tanning process.

SCROOPING COMPOUNDS

Produces a fast scroop on silk, silk and cotton mixed and cotton yarns and material of every description. This scroop will not evaporate. Special formulas upon request.

SCOURING COMPOUNDS

For wool and cotton. Leaves the stock clean and white. Dispenses with use of soap. Low cost.

SOAPS

For textile requirements, suitable for scouring and finishing.

Gum Soap—Substitute for the natural boil-off liquor in silk dyeing. Will not curdle or separate upon addition of an acid to the bath.

Ronopole Soap—A concentrated finishing soap; neutral. Applied in dye bath or for finishing. Imparts softness and produces level shades.

SOFTENERS

For all textile requirements; neutral and stainless, for finishing silk and cotton material.

SULFUR BLACK DEVELOPER

Of special advantage in the dyeing of cotton material, hosiery and yarns with sulfur blacks. Added to the wash-bath, assures a deeper shade of black and gives a softer feel to the material. Eliminates tendering and bronziness.

TIN LACTATE

For brightening and fastening colors in textile printing. Displaces tin oxalate; is safe to use as it will not tender the fabric.

WATERPROOFING COMPOUNDS

For textiles, fabrics and leather.

WOOL MORDANT

Displaces both the bichromate of soda and chrome assistant in the mordanting of wool, prior to the dyeing operation. Assures fast and level dyeings, at a lower cost than the bichromate of soda and tartar, etc., process.

CO-OPERATION

Samples, and directions gladly furnished upon request. Correspondence solicited.

J. T. BAKER CHEMICAL COMPANY

Manufacturers of "Baker's Analyzed" C. P. Acids and Chemicals

PHILLIPSBURG, N. J.

PRODUCTS

"Baker's Analyzed Chemicals"

ANALYZED REAGENTS

About ten years ago we began putting out chemical reagents with an analysis of impurities on the label. The innovation proved a decided success and chemists generally have given their stamp of approval. The idea has also been adopted by other manufacturers and "Analyzed Chemicals" are now being regularly specified. The analysis on the label has been a great help to the chemist in the use of his reagents.

QUALITY

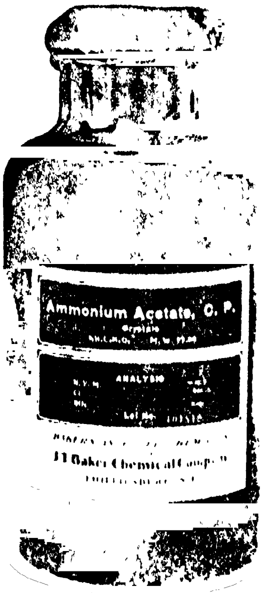
The Baker standard of quality has always signified the best that can be produced in the line of chemicals and acids for reagent use. Our guarantee of analysis means that our reputation is back of the label on the bottle and that the product is dependable. It is our constant effort to improve the quality of our products, the accuracy of their analyses, and the method of packing.

C. P. ACIDS

Hydrochloric, Sp. Gr. 1.19
Nitric, Sp. Gr. 1.42
Sulfuric, Sp. Gr. 1.84
Ammonium Hydrate, Sp. Gr. 0.90

C. P. CHEMICALS

Acetic Anhydride, C. P.
Acid, Arsenious, C. P.
Acid, Carbolic, C. P.
Acid, Chromic, C. P.
Acid, Citric, C. P.
Acid, Formic, C. P.
Acid, Molybdic, C. P.
Acid, Oxalic, C. P.
Acid, Picric, C. P.
Acid, Tartaric, C. P.
Alcohol, Methyl, Absolute
Aluminum Sulfate, C. P.
Ammonium Acetate, C. P.
Ammonium Carbonate, C. P.
Ammonium Chloride, C. P.
Ammonium Molybdate, C. P.
Ammonium Nitrate, C. P.
Ammonium Oxalate, C. P.
Ammonium Persulfate, C. P.
Ammonium Phosphate, C. P.
Ammonium Sulfate, C. P.
Ammonium Thiocyanate, C. P.
Barium Chloride, C. P.
Barium Hydrate, C. P.
Benzene, C. P.
Cadmium Chloride, C. P.
Carbon Bisulfide, C. P.
Carbon Tetrachloride, C. P.
Chloroform, C. P.
Copper Chloride, C. P.
Copper Sulfate, C. P.
Dextrose, C. P.
Ether, C. P.
Ether, Petroleum
Ferric-Ammonium Sulfate, C. P.
Ferric Sulfate, C. P.



STANDARD PACKAGE FOR "BAKER'S ANALYZED C. P. CHEMICALS"

Ferrous Sulfate, C. P.
Lead Acetate, C. P.
Lead Oxide, C. P.
Lead Peroxide, C. P.
Magnesium Chloride, C. P.
Magnesium Sulfate, C. P.
Mercuric Chloride, C. P.
Potassium Bichromate, C. P.
Potassium Bisulfate, C. P.
Potassium Carbonate, C. P.
Potassium Chlorate, C. P.
Potassium Chloride, C. P.
Potassium Cyanide, C. P.
Potassium Ferricyanide, C. P.
Potassium Ferrocyanide, C. P.
Potassium Hydrate, C. P. Sticks
Potassium Iodide, C. P.
Potassium Permanganate, C. P.
Potassium Sulfate, C. P.
Sodium Acetate, C. P.
Sodium Bicarbonate, C. P.
Sodium Bichromate, C. P.
Sodium Bismuthate, C. P.
Sodium Bisulfate, C. P.
Sodium Borate, C. P.
Sodium Carbonate, C. P.
Sodium Chloride, C. P.
Sodium Hydrate, C. P.
Sodium Nitrate, C. P.
Sodium Nitrite, C. P.
Sodium Peroxide, C. P.
Sodium Phosphate, C. P.
Sodium Sulfate, C. P.
Sodium Thiosulfate, C. P.
Sodium Tungstate, C. P.
Zinc Oxide, C. P.

CATALOG

Complete catalog and price-list sent on request.

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CO-OPERATION

Samples, and directions gladly furnished upon request. Correspondence solicited.

REDISTILLED AND CRUDE HYDROCARBON OILS

Product	Remarks
Shingle Stain Oil	Specially prepared clear tar oils with a specific gravity of approximately 1 at 15.5° C. Limpid point not above 0° C. Free from tar acid. Shingle stain oil is particularly adapted for production of light color shingle stains and other paint specialties
Special Heavy Oil	
Creosote Oil	A tar oil with a specific gravity of approximately 1. at 15.5° C.
Neutral Hydrocarbon Oil	A clear, limpid oil, reddish-brown in color.

PHENOLS, CRESOLS AND SPECIAL PRODUCTS

Phenol, U. S. P., Natural	Produced by fractional distillation and guaranteed to meet U. S. P. specification. Melting point 39°-40° C., or higher if especially desired.
Phenol, U. S. P., Synthetic	Produced synthetically, guaranteed not less than 96% absolute phenol.
Cresol, U. S. P.	A mixture of isomeric cresols, free from phenol and meeting U. S. P. specification
Refined Cresylic Acid, No. 5	A true cresol having a wider range of distillation than Cresol, U. S. P.
Ortho-Cresol	A completely separated cresol isomer, with a melting-point not less than 28° C.
Meta-Para-Cresol	A refined cresol mixture containing approximately 40% meta-cresol and 60% para-cresol.
Maleic Acid	Produced synthetically. Purity over 98%.
Fumaric Acid	Produced synthetically. Purity over 99%.
Malic Acid, F. P.	Produced synthetically. High degree of purity. Suitable for use in food products
Anthracene	Guaranteed to contain not less than 80% anthracene.
Carbazole	Guaranteed to contain not less than 80% carbazole
Phenanthrene	A refined product offered in various percentages of purity depending on trade requirements
Nitronaphthalene	Guaranteed melting-point 55° C.
Alpha-Naphthylamine	Guaranteed melting-point not less than 45° C.
Pyridine, Denaturing	Light straw-color, distilling approximately 50% at 140° C. and 90% at 160° C. Offered particularly for denaturing purposes.
Pyridine, Commercial	Very light straw-color, distilling 100% below 200° C
"Cumar"	A synthetic neutral resin or gum, produced from coal-tar distillates by a scientifically and closely controlled process. Graded principally by melting-point, ranging from 50° to 160° C
Denaturing Benzols	Meeting U. S. Government specifications for denaturing alcohol by formulas 2A or 2B
"Barretan" Synthetic Tanning Extracts	Extracts for the tanning of practically every type of leather.

REFINED NAPHTHALENE

Naphthalene, Flake	All forms of refined naphthalene represent a sublimated or crystallized white product having a minimum melting-point of 79° C., with no appreciable quantities of oils, tars, or tar acids present.
Naphthalene, Small Balls	
Naphthalene, Large Balls	
Naphthalene, Crushed	
Naphthalene, Powdered	
Naphthalene, Granulated	
Naphthalene, Rice	
Naphthalene, Lump	
Naphthalene, One-ounce Cakes	
Naphthalene, Square Tablets	
Naphthalene, Round Tablets	
"Cryst Alba"	A very highly refined, sublimated product in scales or flakes.
Naphthalene, Crude	A settled naphthalene containing varying quantities of tar oils. Melting-point averages approximately 70° C.

DISINFECTANTS

"Pyxol"	An emulsifiable disinfectant with a guaranteed carbolic coefficient of 20 as determined by the Rideal-Walker method.
"Tarola X"	A standard cattle and sheep-dip.
Liquor Cresolis Compositus, U. S. P.	Guaranteed to meet U. S. P. specification and Federal Regulations as a dip.
Special Cresol Compound	A permissible substitute for Liquor Cresolis Compositus, U. S. P.
Disinfectants, Coefficients 2 to 20 incl.	Emulsifiable coal-tar disinfectants, carbolic coefficient guaranteed as determined by the Rideal-Walker method.

THE BARBER ASPHALT PAVING COMPANY

Producers of Native Asphalts and Asphaltic Products

LAND TITLE BUILDING, PHILADELPHIA, PA.

Cable Address
"BASPACO", Philadelphia
All Commercial Codes

BRANCH OFFICES
New York, N. Y. — Chicago, Ill. — Kansas City, Mo.
Atlanta, Ga. — Pittsburgh, Pa. — St. Louis, Mo.

PLANTS AND LABORATORIES
Madison, Ill. — Maurer, N. J.

PRODUCTS

- **Asphalts**
  - Trinidad Lake
  - Bermudez Lake
- **Gilsonite**
- **"Genasco"**
  - Asphalt Ready Roofing
  - Asphalt SealBac Shingles
  - Asphalt Built-up Roof Materials,—Trinidad Lake Asphalt
  - Asphalt Mastic, "Genasco Vulcanite" Brand
  - Asphalt Pipe-joint Cement
  - Asphalt Paints
  - Asphalt Putty
  - Asphalt Roof Paints
  - Asphalt Battery-sealing Compound
  - Mineral Rubber
  - Mineral Spirits
  - Solvents
  - Pharmaceutical Oil
  - Frothing Reagents
  - Flotation Oils
  - Soluble Oils
  - Paint Oils
  - Polishes, Furniture and Auto
  - Mineral Wax
  - Ammonium Sulfate
  - Motor Oils

ASPHALTS

The Native Asphalts (Trinidad Lake and Bermudez Lake) possess a number of inherent properties not available in artificial substitutes, the pitches or synthetic compounds.

Native asphalts are being used with constant success for the following purposes

Construction of acid and alkali-proof floors.

Manufacture of paints and varnishes, resisting the effects of water, acids, alkalis and fumes.

Production of printing inks.

Electrical insulation and manufacture of insulating compounds.

Ingredient in rubber compounding in the production of mechanical rubber goods.

The technical use of Asphalts is increasing each year and new industries constantly are finding in asphaltic products a solution to many of their problems.

ASPHALT MASTIC

"Genasco Vulcanite" Mastic is unequaled as a flooring material where resilient, monolithic, waterproof, dustless, sanitary and lasting surface is required.

It is the ideal flooring for laboratories, chemical plants and other places where acid resistance is essential. "Genasco Vulcanite" Mastic floors render the maximum service in factories of all kinds, bakeries, hotels, and similar places.

Acid-proof Mastic is rendering exceptional service as a lining for concrete, metal and wooden tanks. Mastic tank-linings are successfully withstanding a 36% sulfuric acid with 2% nitric acid at 125° F.

Where it is absolutely essential that all water and moisture be excluded from floors and walls, as in silk and other mills, mastic fills the need. It also serves as a lining for pipes carrying chemicals in many plants.

Mastic is finding very extensive use as a complete waterproofing system, for the protection of metal, concrete, brick and masonry construction.

GILSONITE

Gilsonite, the purest natural bitumen, is a hard, lustrous, black, brittle substance. It is plastic when warmed, and fuses at low heat. Gilsonite is completely soluble in all proportions in carbon bisulfide, benzol, chloroform and turpentine.

Gilsonite is an invaluable ingredient in hard-drying black paints, baking japans, varnishes, etc., due to its inherent natural components.

Compounds produced by the use of considerable amounts of Gilsonite are used extensively in the electrical field, due to their rubbery character and the fact that they are non-conductors of electricity, as well as being miscible with insulating compounds. They have also an extensive use in the rubber industry and in waterproofing.

"GENASCO" ACID-PROOF PAINT

"Genasco" Acid-Proof Paint meets the need for a paint that will protect against dilute acids and acid fumes.

It gives excellent service in resisting corrosive gases, dilute acids and alkalis. Manufacturers of sulfuric and nitric acids will find it invaluable. It is also used in painting battery boxes and the interior of refrigerating plants exposed to brine, or ammonia fumes.

Our asphalt paints are manufactured under strict laboratory control, following formulas prepared for providing service under just the conditions for which we recommend them.

"GENASCO" PIPE-JOINT CEMENT

"Genasco" Pipe-Joint Cement is invaluable to the laboratory or chemical plant. It resists all acids and alkalis, and being plastic, does not crack if the pipe alters its position from any cause.

"GENASCO" SOLVENTS

"Genasco" Naphthas and Solvents merit the particular attention of chemical manufacturers of all kinds, paint and varnish producers, and others having use for solvents of low, intermediate and high boiling-points. "Genasco" Solvents are uniform in composition and boiling-point.

SERVICE

We have a completely equipped and up-to-date laboratory for research and testing purposes, and a staff of chemists which gladly will advise industrial plants and others concerning the use of any of our products. We will gladly answer all inquiries regarding the possibility of using Asphalts or Asphaltic products to advantage.

REDISTILLED AND CRUDE HYDROCARBON OILS

Product	Remarks
Shingle Stain Oil	Specially prepared clear tar oils with a specific gravity of approximately 1 at 15.5° C. Limpid point not above 0° C. Free from tar acid. Shingle stain oil is particularly adapted for production of light color shingle stains and other paint specialties.
Special Heavy Oil	
Creosote Oil	A tar oil with a specific gravity of approximately 1. at 15.5° C.
Neutral Hydrocarbon Oil	A clear, limpid oil, reddish-brown in color.

PHENOLS, CRESOLS AND SPECIAL PRODUCTS

Phenol, U. S. P., Natural	Produced by fractional distillation and guaranteed to meet U. S. P. specification. Melting point 39°-40° C., or higher if especially desired.
Phenol, U. S. P., Synthetic	Produced synthetically, guaranteed not less than 96% absolute phenol.
Cresol, U. S. P.	A mixture of isomeric cresols, free from phenol and meeting U. S. P. specification.
Refined Cresylic Acid, No. 5	A true cresol having a wider range of distillation than Cresol, U. S. P.
Ortho-Cresol	A completely separated cresol isomer, with a melting-point not less than 28° C.
Meta-Para-Cresol	A refined cresol mixture containing approximately 40% meta-cresol and 60% para-cresol.
Maleic Acid	Produced synthetically. Purity over 98%.
Fumaric Acid	Produced synthetically. Purity over 99%.
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Anthracene	Guaranteed to contain not less than 80% anthracene.
Carbazole	Guaranteed to contain not less than 80% carbazole.
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Nitronaphthalene	Guaranteed melting-point 55° C.
Alpha-Naphthylamine	Guaranteed melting-point not less than 45° C.
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Pyridine, Commercial	Very light straw-color, distilling 100% below 200° C.
"Cumar"	A synthetic neutral resin or gum, produced from coal-tar distillates by a scientifically and closely controlled process. Graded principally by melting-point, ranging from 50° to 160° C.
Denaturing Benzols	Meeting U. S. Government specifications for denaturing alcohol by formulas 2A or 2B.
"Barretan" Synthetic Tanning Extracts	Extracts for the tanning of practically every type of leather.

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- Asphalt Battery-sealing Compound
- Mineral Rubber
- Mineral Spirits
- Solvents
- Pharmaceutical Oil
- Frothing Reagents
- Flotation Oils
- Soluble Oils
- Paint Oils
- Polishes, Furniture and Auto
- Mineral Wax
- Ammonium Sulfate
- Motor Oils

ASPHALTS

The Native Asphalts (Trinidad Lake and Bermudez Lake) possess a number of inherent properties not available in artificial substitutes, the pitches or synthetic compounds.

Native asphalts are being used with constant success for the following purposes

Construction of acid and alkali-proof floors.

Manufacture of paints and varnishes, resisting the effects of water, acids, alkalis and fumes.

Production of printing inks.

Electrical insulation and manufacture of insulating compounds.

Ingredient in rubber compounding in the production of mechanical rubber goods.

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ASPHALT MASTIC

"Genasco Vulcanite" Mastic is unequaled as a flooring material where resilient, monolithic, waterproof, dustless, sanitary and lasting surface is required.

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Acid-proof Mastic is rendering exceptional service as a lining for concrete, metal and wooden tanks. Mastic tank-linings are successfully withstanding a 36% sulfuric acid with 2% nitric acid at 125° F.

Where it is absolutely essential that all water and moisture be excluded from floors and walls, as in silk and other mills, mastic fills the need. It also serves as a lining for pipes carrying chemicals in many plants.

Mastic is finding very extensive use as a complete waterproofing system, for the protection of metal, concrete, brick and masonry construction.

GILSONITE

Gilsonite, the purest natural bitumen, is a hard, lustrous, black, brittle substance. It is plastic when warmed, and fuses at low heat. Gilsonite is completely soluble in all proportions in carbon bisulfide, benzol, chloroform and turpentine.

Gilsonite is an invaluable ingredient in hard-drying black paints, baking japans, varnishes, etc., due to its inherent natural components.

Compounds produced by the use of considerable amounts of Gilsonite are used extensively in the electrical field, due to their rubbery character and the fact that they are non-conductors of electricity, as well as being miscible with insulating compounds. They have also an extensive use in the rubber industry and in waterproofing.

"GENASCO" ACID-PROOF PAINT

"Genasco" Acid-Proof Paint meets the need for a paint that will protect against dilute acids and acid fumes.

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W. J. BUSH & CO., INC.

Manufacturing Chemists

370 SEVENTH AVENUE, NEW YORK, N. Y.
(Penn Terminal Bldg.)

Cable Address
"TANGERINE" New York

"ye Oldeſte Eſſence Diſtillers"

BRANCH OFFICES
70 Kilby Street, Boston
41 W. Lake Street, Chicago

LABORATORY AND WORKS
Linden, N. J.

WESTERN FACTORY
National City, Calif.

EUROPEAN WORKS
London, England
Mitcham, England
Messina, Italy
Grasse, France

FOREIGN BRANCHES
Melbourne, Australia
Sydney, Australia
Moscow, Russia
Montreal, Canada

PRODUCTS

- Chemicals, Fine and Synthetic
- Essential Oils
- Essential Oils, Terpeneless
- Ethers
- Food Colors
- Fruit Flavors
- Oleoresins
- Sugar Colorings

CHEMICALS, FINE AND SYNTHETIC

Amyl Acetate (Absolute)
Amyl Butyrate
Amyl Valerianate
Aubepine
Benzaldehyde, U. S. P.
Benzyl Acetate
Benzyl Benzoate
Citral
Coumarin
Eucalyptol
Eugenol
Geraniol
Geranyl Acetate
Heliotropine
Isoeugenol (Rectified)
Linalyl Acetate
Methyl Anthranilate
Nerolin
Phenylethyl Alcohol
Thymol
Vanillin

ESSENTIAL OILS

Almond, Bitter, U. S. P.
Almond, Bitter (Free from Prussic Acid)
Cardamom
Cassia, Redistilled
Cinnamon (Ceylon)
Clove
Coriander
Eucalyptus
Fennel
Geranium (African)
Ginger
Lavender
Lemon (Pressed from ripe fruit in Southern California)
Lemongrass
Mace
Mustard
Neroli
Nutmeg
Orange (California)
Orris
Patchouli
Peppermint
Rose
Sandalwood
Vetivert
Wintergreen (Gaultheria)

ESSENTIAL OILS, TERPENELESS

Anise
Caraway
Lemon
Limes
Orange

ETHERS

Acetic
Butyric
Œnanthic
Pelargonic
Rum
Valerianic

FOOD COLORS "HYGIENO"

"Hygieno" colors are of purely natural origin, and comply with the pure food laws of all states. They are not coal-tar colors. We supply "Hygieno" colors in all the necessary tints in both paste and liquid form, packed in 1 lb. and 5 lb. bottles and 125 lb. kits.

Blacks
Blues
Browns
Greens
Pinks
Reds
Violets
Yellows

CERTIFIED FOOD COLORS

These Colors are made from the dyes permitted by the U. S. Department of Agriculture, and are certified in accordance with the regulations of the Department.

Blue
Brown
Greens
Lilac
Orange
Pinks
Reds
Violet
Yellows
Yolk of Egg Shade

FRUIT FLAVORS

We produce both natural and artificial fruit flavors of all kinds for confectioners, soft drink manufacturers and bottlers.

OLEORESINS

Capsicum
Cloves
Ginger
Orris
Sandalwood
Vanilla

SUGAR COLORINGS (Caramels)

Unequaled for strength and brilliancy. Will not deposit. In two grades Two Stars and Three Stars. For all purposes. Unaffected by fruit acids.

OIL OF APRICOT KERNELS

This oil is pressed at our California plant from Apricot Kernels exclusively.

It is a pure, wholesome, nutritious food product of delicate flavor, serving as a perfect substitute for olive oil, cotton-seed oil, and the like, for all food purposes.

Industrially Oil of Apricot Kernels serves admirably for the production of textile soaps, textile lubricants, softeners, etc.

Packed in 50 lb. boxed tins and 400 lb. drums.

THE BARBER ASPHALT PAVING COMPANY

Producers of Native Asphalts and Asphaltic Products

LAND TITLE BUILDING, PHILADELPHIA, PA.

Cable Address
"BASPACO", Philadelphia
All Commercial Codes

BRANCH OFFICES
New York, N. Y. — Chicago, Ill. — Kansas City, Mo.
Atlanta, Ga. — Pittsburgh, Pa. — St. Louis, Mo.
PLANTS AND LABORATORIES
Madison, Ill. — Maurer, N. J.

PRODUCTS

Asphalts
- Trinidad Lake
- Bermudez Lake

Gilsonite

"Genasco"
- Asphalt Ready Roofing
- Asphalt Seallbac Shingles
- Asphalt Built-up Roof Materials,—Trinidad Lake Asphalt
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C. W. CAMPBELL CHEMICALS

Importers and Exporters

5 Cliff Street

NEW YORK, N. Y.

Cable Address "CAMBEL", New York

WAREHOUSE New Brunswick, N. J.

PRODUCTS

Chemicals for the Manufacture of Matches, Fireworks and Railway Signals, and for other Industries.

BENZIDINE

Base Dry

Sulphate Paste

FORMALDEHYDE

FUCHSINE

GLUE

GUMS

Arabic

Damar

Tragacanth

OXALIC ACID

PHOSPHORUS

Amorphous (Red)

Sesquisulphide

Yellow

POTASSIUM SALTS

Bichromate

Chlorate

Hydroxide (Caustic Potash)

Perchlorate

SAL AMMONIAC

SODA ASH

SODIUM SALTS

Bichromate

Chlorate

Ferrocyanide (Yellow Prussiate)

Hydroxide (Caustic Soda)

Nitrite

STRONTIUM NITRATE

ZINC OXIDE

SERVICE

We handle many of the chemicals required in special industries and can supply products to meet particular specifications, and guarantee all products to be of standard grade.

STOCKS

At our New Brunswick warehouse we maintain stocks of chemicals for the match and other industries, from which prompt shipments can always be made.

QUOTATIONS

Quotations and other information regarding our products gladly furnished at all times.

EXPORT

Special attention given to foreign orders and inquiries.

THE BARBER ASPHALT PAVING COMPANY

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CELLULOSE PRODUCTS CORPORATION

78-80 Paris Street
NEWARK, N. J.

Cable Address
"CELLULOSE," Newark

PRODUCTS

Nitrocellulose Materials
Soluble Washed Films
Film Perforations
Scrap Celluloid
Raw Films

NITROCELLULOSE MATERIALS

We are producers of reclaimed nitrocellulose material of various kinds and colors for all purposes, and shall be glad to co-operate with users of these materials to produce the exact grade required for their particular product.

SOLUBLE WASHED FILMS

Standard cinematograph film in scrap form is thoroughly and completely degelatinized and desilvered. All traces of alkali, silver, silver salts and gelatin are removed, as well as all silver spots. This scrap is perfectly transparent, and water-white in color. It is guaranteed to be absolutely free from cellulose acetates or other constituents which might exert a harmful influence in the production of plastics, solutions, etc. It is in all respects and for all purposes the equal and complete equivalent of new guncotton, with the advantage of being very much cheaper in price.

This material is completely soluble, without residue in acetone, amyl acetate, ethyl acetate or in denatured alcohol (U. S. Internal Revenue Dept. Regulations Specially denatured alcohol formulas Nos. 1, 2, 2a, 2b, 5, 10, 11, 19), also in a number of newer chlorinated solvents.

When dissolved in the proper solvent, this material is eminently suited for the production of finishes and lacquers for patent and artificial leather; dope finishes for split, automobile and upholstery leathers; waterproofing textile fabrics of various kinds; "dopes" for airplane wings; varnishes, lacquers, coatings, and the like, for automobiles, carriages, electric insulation, food containers, metal, picture frames, railroad cars, signs; special lacquers for chemical and physical instruments such as analytical balances, microscopes, telescopes, etc.; floor, transparent, waterproof, weatherproof, and wood varnishes; cements and adhesives for leather belting, leather to metal, etc.; paint removers.

When dissolved in our special solvent, our reclaimed films can be made into sheets of any size, which are perfectly transparent, and can be utilized for the manufacture of eyepieces for goggles, gas-masks, etc., and water- and weatherproof windows for tents, automobile tops, ready-made houses, huts, airplanes, and the like.

FILM PERFORATIONS

These small oval pieces, about 2 mm. wide and 4 mm. long, are of a superior quality. They are of the same general composition as raw film, except that they have never been through the developing and fixing solutions.

The perforations are treated by our scientific and complete process of degelatinization and desilverization and are thoroughly clean and dry.

These small particles of film material possess all the advantages of our soluble washed film scrap, and are used in the same manner and for the same purposes. In addition they are more easily handled, go into solution more readily, and are ideal for the preparation of solutions, as the exact weight or volume required can be measured out by means of a scoop.

SCRAP CELLULOID

We only handle camphor celluloid, never that produced by means of camphor substitutes, hence it is never necessary to add gum or synthetic camphor when working up our celluloid scrap.

The scrap is clean, free from foreign matter, and can be furnished in the following colors: Transparent, Shell, White, Ivory, Black, and Mixed. We also furnish this material in the form of shavings and lathe turnings, but only white or shell.

This material is soluble in acetone, amyl acetate, denatured alcohol (Formulas Nos. 2, 2a, 2b), and other solvents.

This scrap can be soaked down in a cheap solvent, such as acetone, until it becomes plastic, and then formed into rods, tubes, etc.

It is used for the preparation of various lacquers, varnishes, waterproofing compounds, and the like; also as a constituent of paint removers.

We are prepared to furnish celluloid solutions of any color for use in spraying or dipping handles of all kinds, cabinets, seats, and the like.

We have so enlarged our facilities that we are in a position to do this spraying or dipping for those who desire it, promptly and efficiently.

RAW OR SCRAP FILMS

This product, which is mutilated or otherwise unfit for show purposes, is offered for sale in the condition as received from direct sources, such as moving-picture studios, laboratories, and producers. It has not been treated by us in any way.

Being soluble in the usual solvents, it can be manufactured into varnishes, lacquers, etc.

SHIPPING CONTAINERS

The various nitrocellulose materials are packed and shipped in strong wooden boxes (50, 100 and 200 lb.).

SERVICES

Full details for utilizing our products, and working formulas will be gladly furnished to those interested. Send us your inquiries. They will have careful attention. Our experts are at your disposal for advice, and to help you solve your problems and difficulties.

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CHIPMAN CHEMICAL ENGINEERING COMPANY, INC.

Manufacturers of Arsenicals—Producers of White Arsenic

Cable Address
"DEOXYDIZER", New York
Code A B C, Fifth Ed

BRANCH OFFICE
525 Market Street
San Francisco Calif

95-97 Liberty St.

NEW YORK, N. Y

ATLAS ARSENIC MINE
Floyd County, Va

FACTORIES
Bound Brook, N J
Portland, Ore
Houston, Tex

PRODUCTS

- White Arsenic
- Arsenicals
- Insecticides
- Disinfectants
- "Ruskilla"—Structural Steel Paint
- Chipman– Skin and Hide Preservative
- Atlas—Wood Preservative
- Chipman Disinfectant
- Chipman Sheep Dipping Powder

ATLAS CATTLE DIP IMPROVED

A concentrated arsenical preparation approved by the United States Department of Agriculture for official dipping of cattle for tick eradication

ATLAS 50% CRESOL COMPOUND

A highly efficient disinfectant and antiseptic giving a clear solution in water Approved by the United States Department of Agriculture for official disinfection of stock cars, etc

"ATLASOL" DISINFECTANT

A coal tar product, giving a clean milkwhite permanent emulsion with water Coefficient 3 when tested by the Hygienic Laboratory method

ATLAS "A" WEED KILLER

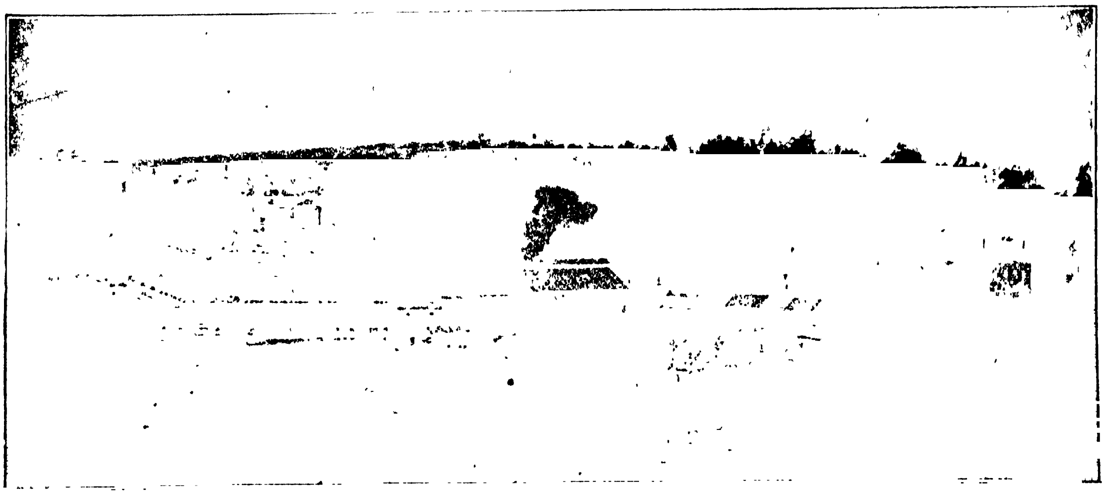
The most effective and widely used Weed Killer on the market It eradicates obnoxious weed growth on roads, driveways, tennis courts, etc. Largely used by railroads for destroying vegetation on the right of way

SODIUM ARSENITE SOLUTIONS

Concentrated solutions of sodium acid arsenite, primary and secondary sodium arsenite

ATLAS BOILER COMPOUND

Highly concentrated liquid preparation for softening boiler waters without preliminary treatment Prevents corrosion due to oxidation Removes encrusted solids



ATLAS ARSENIC MINE AND REFINERY, FLOYD COUNTY, VA.

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- Asphalt Ready Roofing
- Asphalt Seallbac Shingles
- Asphalt Built-up Roof Materials,—Trinidad Lake Asphalt
- Asphalt Mastic, "Genasco Vulcanite" Brand
- Asphalt Pipe-joint Cement
- Asphalt Paints
- Asphalt Putty
- Asphalt Roof Paints
- Asphalt Battery-sealing Compound
- Mineral Rubber
- Mineral Spirits
- Solvents
- Pharmaceutical Oil
- Frothing Reagents
- Flotation Oils
- Soluble Oils
- Paint Oils
- Polishes, Furniture and Auto
- Mineral Wax
- Ammonium Sulfate
- Motor Oils

ASPHALTS

The Native Asphalts (Trinidad Lake and Bermudez Lake) possess a number of inherent properties not available in artificial substitutes, the pitches or synthetic compounds.

Native asphalts are being used with constant success for the following purposes

Construction of acid and alkali-proof floors.

Manufacture of paints and varnishes, resisting the effects of water, acids, alkalis and fumes.

Production of printing inks.

Electrical insulation and manufacture of insulating compounds.

Ingredient in rubber compounding in the production of mechanical rubber goods.

The technical use of Asphalts is increasing each year and new industries constantly are finding in asphaltic products a solution to many of their problems.

ASPHALT MASTIC

"Genasco Vulcanite" Mastic is unequaled as a flooring material where resilient, monolithic, waterproof, dustless, sanitary and lasting surface is required.

It is the ideal flooring for laboratories, chemical plants and other places where acid resistance is essential. "Genasco Vulcanite" Mastic floors render the maximum service in factories of all kinds, bakeries, hotels, and similar places.

Acid-proof Mastic is rendering exceptional service as a lining for concrete, metal and wooden tanks. Mastic tank-linings are successfully withstanding a 30% sulfuric acid with 2% nitric acid at 125° F.

Where it is absolutely essential that all water and moisture be excluded from floors and walls, as in silk and other mills, mastic fills the need. It also serves as a lining for pipes carrying chemicals in many plants.

Mastic is finding very extensive use as a complete waterproofing system, for the protection of metal, concrete, brick and masonry construction.

GILSONITE

Gilsonite, the purest natural bitumen, is a hard, lustrous, black, brittle substance. It is plastic when warmed, and fuses at low heat. Gilsonite is completely soluble in all proportions in carbon bisulfide, benzol, chloroform and turpentine.

Gilsonite is an invaluable ingredient in hard-drying black paints, baking japans, varnishes, etc., due to its inherent natural components.

Compounds produced by the use of considerable amounts of Gilsonite are used extensively in the electrical field, due to their rubbery character and the fact that they are non-conductors of electricity, as well as being miscible with insulating compounds. They have also an extensive use in the rubber industry and in waterproofing.

"GENASCO" ACID-PROOF PAINT

"Genasco" Acid-Proof Paint meets the need for a paint that will protect against dilute acids and acid fumes.

It gives excellent service in resisting corrosive gases, dilute acids and alkalis. Manufacturers of sulfuric and nitric acids will find it invaluable. It is also used in painting battery boxes and the interior of refrigerating plants exposed to brine, or ammonia fumes.

Our asphalt paints are manufactured under strict laboratory control, following formulas prepared for providing service under just the conditions for which we recommend them.

"GENASCO" PIPE-JOINT CEMENT

"Genasco" Pipe-Joint Cement is invaluable to the laboratory or chemical plant. It resists all acids and alkalis, and being plastic, does not crack if the pipe alters its position from any cause.

"GENASCO" SOLVENTS

"Genasco" Naphthas and Solvents merit the particular attention of chemical manufacturers of all kinds, paint and varnish producers, and others having use for solvents of low, intermediate and high boiling-points. "Genasco" Solvents are uniform in composition and boiling-point.

SERVICE

We have a completely equipped and up-to-date laboratory for research and testing purposes, and a staff of chemists which gladly will advise industrial plants and others concerning the use of any of our products. We will gladly answer all inquiries regarding the possibility of using Asphalts or Asphaltic products to advantage.

COMMERCIAL SOLVENTS CORPORATION

Cable Address
"COMSOLVENT", New York

GENERAL OFFICES AND PLANT
TERRE HAUTE, INDIANA

EASTERN SALES AND EXPORT
17 East 42d Street New York, N. Y.

PRODUCTS

Acetone, U.S.P.
Butanol (Butyl Alcohol)
Ethyl Alcohol, Denatured

PLANT

Our plant, located in Terre Haute, Ind., was owned and operated during the late war by the United States and British Governments for the special purpose of manufacturing acetone from corn (maize).

PROCESS

We own exclusive rights to operate the Weizmann process (patented in the U. S.) for the bacterial fermentation of corn or other cereal grains. All raw materials are thoroughly sterilized before use, insuring exceptionally pure products and the absolute absence of impurities usually found in these and similar products manufactured by other processes.

ACETONE (Dimethylketone) $CH_3.CO.CH_3$

The Acetone produced by us is U. S. P., and surpasses the stringent specifications of the United States and British War Departments. It is free from poisonous and other impurities found in Acetone made from wood distillation products.

Specifications

Specific Gravity: Less than 0.80 (15°C.)
Boiling-point: 56.5°C. (90 to 95% distilling below 58%).
Color: Water-white.
Acidity: None.
Alkalinity: None.
Water: None.

Uses

General solvent (varnishes, lacquers, acetylene gas, etc.).
Special solvent in the manufacture of cordite, smokeless powder, celluloid, plastics, etc.
Manufacture of chloroform.
Manufacture of Diacetone Alcohol.
For Denaturing Alcohol.
Organic synthesis.

Shipping Containers

Iron drums (55,110 gallons).
Tank-cars (8,000 gallons).

BUTANOL (Butyl Alcohol) $CH_3(CH_2)_2.CH_2OH$

The Commercial Solvents Corporation is the largest manufacturer of Butanol (Butyl Alcohol) in America. Our product is strictly anhydrous, water-white in color, free from acids and aldehydes, and neutral in reaction.

Butanol has successfully replaced Fusel Oil in general use as a solvent.

Specifications

Specific Gravity: 0.810 to 0.815 (20°C. 20°C.).
Boiling-point: 114° to 117°C. (90%, distilling between these temperatures).
Color: Water-white.
Aldehydes: None.
Water: None.
Acetic Acid: None.
Butyric Acid: None.
Lactic Acid: None.

Uses

Special solvent and vehicle in the pyroxylin industries (celluloid, photographic film, etc.).
General solvent (japans, lacquers, coatings, dopes, etc.)
Manufacture of Butyl Acetate, Butyl Aldehyde, Butyl Salicylate, Butylene Gas, Butyric Acid, Butyric Ether, Ethyl Butyrate, etc.
Production of color bases, synthetic rubber.
Vehicle for bronze powders.
Constituent of paint and varnish removers, imitation leather coatings and patent leather "dopes."
General organic synthesis.
Preparation of liniments, drug and pharmaceutical preparations, fruit essences.
Production of methylethyl ketone.
Solvent for gums, resins, shellac, soaps, essential oils, vegetable oils, waxes, pigments, drugs, chemicals, etc.

Shipping Containers

Tin cans (1, 5, 10 gallons).
Iron drums (55,110 gallons).
Tank-cars (8,000 gallons).

ETHYL ALCOHOL (188 and 190 proof).

Denatured in accordance with all formulas.

Shipping Containers

Iron drums (55,110 gallons).
Tank-cars (8,000 gallons).

SERVICES

The Chemical Staff of the Commercial Solvents Corporation will, at all times, be pleased to cooperate with manufacturers in solving their solvent problems. We maintain, at our plant, well equipped Research Laboratories, the services and facilities of which are for the assistance of our customers.

COMMONWEALTH CHEMICAL CORPORATION

Cable Address
"COMCHEMCO" New York
Codes
A B C 5th Edition
Western Union

MAIN OFFICE
15 Park Row
NEW YORK, N. Y.

WESTERN SALES OFFICE
608 South Dearborn Street
CHICAGO, ILL.

COMMONWEALTH CHEMICAL CORPORATION OF CANADA, LIMITED

WALKERVILLE, ONTARIO, CANADA

PRODUCTS

- **Benzaldehyde**
- **Benzoic Acid**
- **Benzyl Acetate**
- **Cinnamic Acid**
- **Coumarin**
- **Ethyl Benzoate**
- **Lithium Benzoate**
- **Methyl Benzoate**
- **Sodium Benzoate**

BENZALDEHYDE, Technical

97-98% aldehyde content.
Used by manufacturers of dyestuffs, photographic and pharmaceutical chemicals
Containers:
  Returnable steel drums, approximately 500 and 1000 lb. net.
  Returnable carboys of 100 lb. net.

BENZALDEHYDE, U. S. P.

98-99% aldehyde content.
Water-white.
Boiling-point 177°-179° C.
Free from organic chlorides (Lange's method).
Containers:
  Tin cans of 5 and 25 lb. net.
  Returnable carboys of 100 lb. net
  Returnable block-tin-lined drums, 500 and 1000 lb. net.

BENZOIC ACID, U. S. P., Sublimed

Large, pure white, lustrous flakes.
Melting-point 121° C.
Free from foreign odor.
Meets requirements of United States, British and Japanese Pharmacopeias, and French Codex.
Containers:
  Kegs of 50 and 100 lb. net.
  Tin cans of 1, 2, 5, 10 and 25 lb. net.

BENZYL ACETATE, C. P.

97-98% ester content.
Boiling-point 216° C.
Water-white.
For perfumers and toilet-soap-makers.
Containers:
  Tin cans of 5 and 25 lb. net.
  Returnable block-tin-lined drums, 500 and 1000 lb. net.

CINNAMIC ACID, Synthetic, C. P.

Melting-point 130° C.
Odorless crystals.
Containers:
  Kegs of 50 and 100 lb. net.
  Tin cans of 1, 2, 5, 10 and 25 lb. net.

COUMARIN, C. P.

White, shiny crystals.
Melting-point 67° C. Boiling-point 291° C.
Containers:
  Tin cans of 1, 5, 10 and 25 lb. net.

ETHYL BENZOATE (Benzoic Ether)

96-97% ester content.
Water-white.
Boiling-point 212° C.
Containers:
  Tin cans of 5 and 25 lb. net.
  Returnable block-tin-lined drums, 500 and 1000 lb. net.

LITHIUM BENZOATE, U. S. P., 8th Revision

White, odorless and tasteless powder.
Makes a clear, colorless solution.
Answers purity tests of French Codex, but contains no water of crystallization.
Containers:
  Kegs of 50 and 100 lb. net.
  Tin cans of 1, 2, 5, 10 and 25 lb. net.

METHYL BENZOATE (Oil of Niobe)

96-97% ester content.
Water-white.
Boiling-point 199° C.
Containers:
  Tin cans of 5 and 25 lb. net.
  Returnable block-tin-lined drums, 500 and 1000 lb. net.

SODIUM BENZOATE, U. S. P., 8th and 9th Revisions

White, amorphous powder.
Readily soluble.
Odorless, tasteless.
Makes a clear, colorless solution.
Meets requirements of British and Japanese Pharmacopeias. Answers purity tests of French Codex, but contains no water of crystallization.
Containers:
  Kegs of 50 and 100 lb. net.
  Tin cans of 1, 2, 5, 10 and 25 lb. net.

TELEPHONE: 5465 Worth

ESTABLISHED 1857
INCORPORATED 1907

Cable Address, COCTION, New York
(A, B, C Code, 4th and 5th Ed.)
Western Union

CHAS. COOPER & CO.

Manufacturing Chemists and Importers

194 Worth Street, NEW YORK, N. Y.
Near Chatham Square

PRODUCTS

Specialties for the Wholesale Drug Trade

- Acid, Boric
- Acids, Muriatic, Nitric and Sulphuric, C. P
- Alum, Powdered
- Ammonia, U S P
- Bicarbonate Sodium
- Castor Oil, U S P.
- Cathartic Salt
- Collodion, U. S P.
- Collodion, Flexible
- Epsom Salt
- Ether, Sulphuric, U. S P
- Silver Nitrate, etc.

Specialties for the Paint and Varnish Trade

- Acids, Muriatic, Nitric and Sulphuric
- Ammonia, Technical
- Alcohol, Denatured
- Black Oxide of Manganese
- Bronzing Liquid
- Chromium Oxide
- Collodions
- Ketone Solvent
- Lead Acetate
- Manganese Borate, etc.

Specialties for the Photo-engraving Trade

- Acids, Muriatic and Nitric
- Alcohol, Denatured
- Ammonium, Iodide
- Benzol
- Cadmium, Iodide
- Collodion Base
- Collodion, Stripping
- Cotton, Absorbent
- Cotton, Negative
- Cotton, Soluble
- Ether, Sulphuric, U. S. P
- Potassium, Bromide
- Potassium, Iodide
- Sodium Cyanide
- Sodium Monosulphide, etc

Specialties for the Rubber Trade

- Antimony, Crimson
- Antimony Golden, Sulphurated
- Barium Sulphate
- Benzol
- Carbon Bisulphide
- Carbon Tetrachloride
- Caustic Soda
- Chromium Oxide, Green
- Flour Sulphur
- Iron Oxide, Red
- Neutral Salts for Rubber Reclaiming
- Zinc Oxide, etc.

Specialties for the Plating Trade

- Acids, Muriatic, Nitric and Sulphuric
- Ammonia
- Arsenic
- Acid, Boric
- Copper Carbonate
- Copper Sulphate
- Nickel and Ammonium Sulphate
- Nickel Sulphate, Pure
- Silver Nitrate
- Sodium Cyanide
- Zinc Carbonate
- Zinc Sulphate, etc.

Specialties for the Photographic Trade

- Acid, Acetic
- Acid, Pyrogallic
- Alum, Powdered
- Chrome, Alum
- Collodion, Photo
- Cooptol
- Cotton, Absorbent
- Gold Chloride
- Hydroquinone
- Mercuric Chloride
- Potassium Ferricyanide
- Silver Nitrate
- Sodium Carbonate
- Sodium Thiosulphate (Hypo)
- Sodium Sulphite, etc.

WORKS AT NEWARK, N. J.

QUALITY AND PRICES

The chemicals we offer are second to none; and prices are named according to the quantity. We would appreciate an opportunity to figure on your requirements.

Monthly price list issued.

RALPH L. CROSTHWAITE COMPANY

MANUFACTURERS' EXCLUSIVE AGENTS

Manufacturers, Importers and Exporters

BRANCH OFFICE
1627 Marquette Bldg
Chicago, Ill

FACTORY
Brooklyn, N. Y.

Chemicals, Dyestuffs and Minerals
Rare and Unusual Ores

15 PARK ROW, NEW YORK, N. Y.

Cable Address
"ARELCROSCO," New York
CODES
Western Union, 5 letter
A B C, Fifth Edition
Bentleys

PRODUCTS

- **Acids**
- **Chemicals**
- **Drums**
- **Dyestuffs**
- **Fluorspar**
- **Intermediates**
- **Oils**
- **Ores**
- **Paint Pigments**
- **Potassium Salts**
- **Sodium Salts**

ACIDS

- Benzoic
- Boric
- Citric
- Formic
- Molybdic
- Oxalic
- Tartaric

CHEMICALS

- Alcohol; for Industrial purposes and Export
- Alcohol, Denatured, Completely, and Special Formulas
- Aluminum Sulfate
- Ammonium Sulfate
- Borax
- Chalk, Precipitated, Light
- Chrome Alum, Ground, and Lump
- Copper Oxide, Black
- Copper Suboxide, Red
- Cream of Tartar
- Formaldehyde
- Potash Alum, Ground, and Lump
- Salicylates

DYESTUFFS

- Brilliant Green
- Malachite Green, Large Crystals, and Crystalline
- Methyl Violet
- Methylene Blue
- Wool Green "S"

FLUORSPAR

- Washed Gravel
- 80 to 85%
- Ground, 90%
- Ground for acid purposes, 99% plus

We have our own Fluorspar properties in Colorado

INTERMEDIATES

- Aniline Oil
- Aniline Salt
- Beta-Naphthol
- Diethylaniline
- Dimethylaniline
- Para-Nitraniline

OILS

- Castor
- Coconut
- Olive
- Olive Foots

ORES

- Molybdenum
- Tungsten
- Vanadium

Our mining properties are located in Colorado and New Mexico, and we specialize in the above alloy ores.

PAINT PIGMENTS

- Barytes
- Carbon Black
- Domestic Ocher
- French Ocher
- Red Oxide
- Whiting

POTASSIUM SALTS

- Caustic Potash
- Bichromate
- Bitartrate
- Chlorate
- Chloride
- Cyanide
- Nitrate
- Oxalate
- Permanganate
- Prussiates

SODIUM SALTS

- Benzoate
- Borate
- Chlorate
- Cyanide
- Nitrate
- Nitrite
- Oxalate

DRUMS

We carry a large stock of second-hand drums at all times at our yard in Newark, N. J., and always have stock rolling in all parts of the country.

We also supply new drums for export trade.

Being specialists in second-hand drums for the chemical industries, we are in a position to fill promptly all orders for the standard sizes.

THE DAVISON CHEMICAL COMPANY

Established 1832

Cable Address
"DAVISON," Baltimore

GARRETT BUILDING, BALTIMORE, MD.

NEW YORK OFFICE 120 Broadway

WORKS
Curtis Bay, Md

PRODUCTS

- **Sulfuric Acid**
- **Acid Phosphate**
- **Concentrated Acid Phosphate (Double Superphosphate)**
- **Magnesium Fluosilicate**
- **Niter Cake**
- **Sintered Pyrites Cinder**

SULFURIC ACID

Our Sulfuric acid is exceptionally low in lead, iron and arsenic. We regularly produce and have ready for shipment:

Chamber Acid,	50 Bé
Tower or Concentrated Acid,	60° Be.
Concentrated Acid,	66° Be

We are in a position to meet any and all specifications required. We invite inquiries from all who require sulfuric acid in bulk shipments.

Shipping containers Iron drums (725 lb.), tank cars (100,000 lb.); tank barges (up to 800 tons)

Davison Sulfuric Acid is used with constant success in petroleum refining; production of mixed acid for nitration; pickling iron and steel; in the textile, tanning, paper, rubber, and metallurgical industries; sulfonation of benzol; dyestuff manufacture; production of other acids; manufacture of sulfates, alums and various inorganic preparations; refining of coal-tar distillates, etc.

ACID PHOSPHATE

Davison Acid Phosphate is produced in the usual Davison standard of quality and is used mainly for fertilizing purposes, either directly or for the production of mixed fertilizers.

The excellent rail and water loading facilities of The Davison Chemical Company permit them to make shipment, either in bulk or bags, in lots ranging from single carloads to cargoes for the largest freight steamers.

Special steamer-loading equipment, with a capacity of 2000 tons per day, has been installed to take care of export business.

CONCENTRATED ACID PHOSPHATE (Double Superphosphate)

Davison Concentrated Acid Phosphate is a monobasic Calcium Phosphate, combined with free Phosphoric Acid according to the total percentage of Phosphoric Acid required.

It is a concentrated source of phosphoric acid for plant food and mixed fertilizer manufacture. Its high strength makes it economical for shipment over long distances.

MAGNESIUM FLUOSILICATE (Magnesium Silicofluoride)

Davison Magnesium Fluosilicate ($MgSiF_6$) is of value to all branches of the ceramic industry, as well as for the production of concrete hardeners.

NITER CAKE

This commercial grade of Sodium Bisulfate is finding extensive use as a substitute for sulfuric acid in textile dyeing, iron and steel pickling, etc.

SINTERED PYRITES CINDER

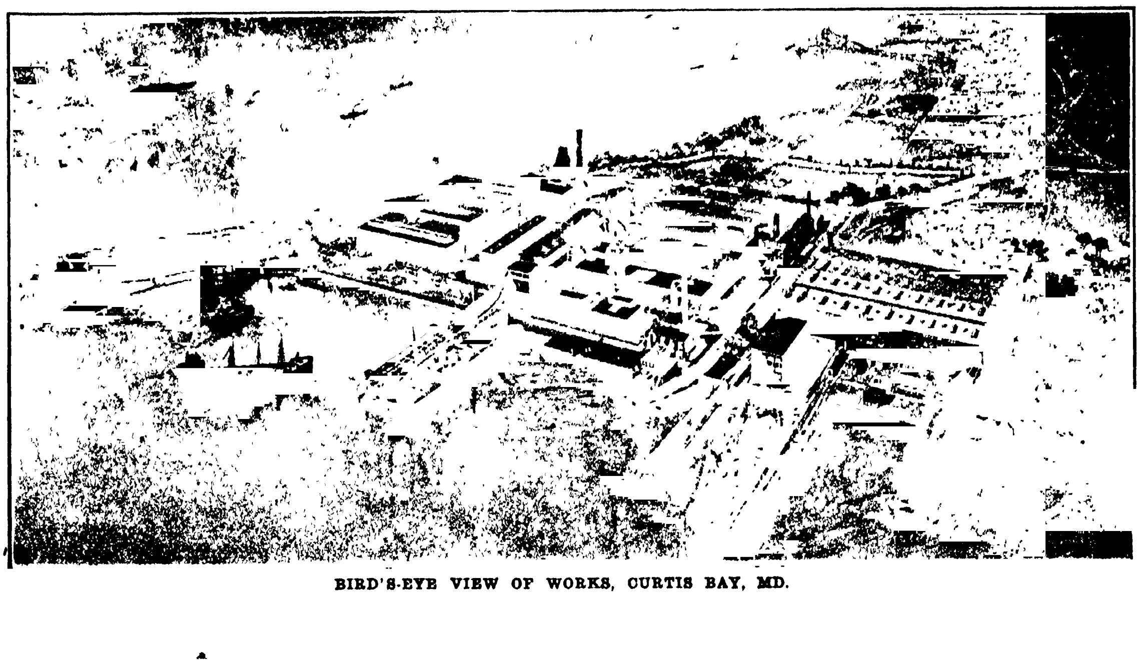
Davison Sinter finds extensive use as a source of iron. It is low in sulfur and copper; and owing to its dense yet porous structure it forms an excellent material to mix with the usual ore burden of blast furnaces.

INQUIRIES

All inquiries should be addressed to 1100 Garrett Building, Baltimore, Md.

PLANT

The Davison Chemical Company has the largest and most modern sulfuric acid plant and acid phosphate plant in the world. The acid plant capacity is 350,000 tons 50° Bé. per year; while the acid phosphate plant has a capacity in excess of 400,000 tons 16% basis per year.



BIRD'S-EYE VIEW OF WORKS, CURTIS BAY, MD.

THE DOW CHEMICAL COMPANY

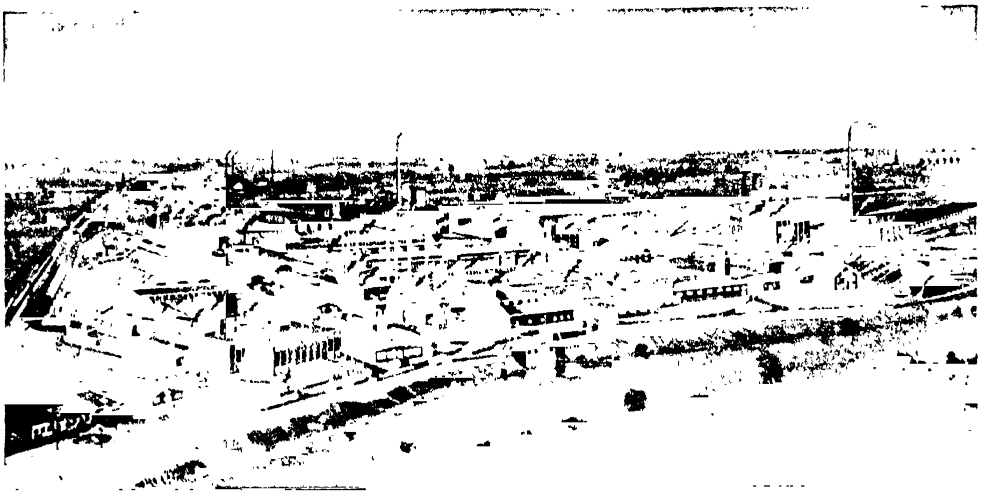
MIDLAND, MICHIGAN

90 West Street, New York, N Y

Cable Address
"DOWCHEMCO," Midland

PRODUCTS

- **Acetylsalicylic Acid,** NNR
- **Acetic Anhydride**
- **Acetylene Tetrabromide**
- **Antimony Tribromide**
- **Barium Bromate**
- **Barium Bromide**
- **Bromine,** Purified or Commercial
- **Bromoform,** U. S. P.
- **Cadmium Bromate**
- **Cadmium Bromide**
- **Calcium Arsenate**
- **Calcium Bromide,** U. S. P.
- **Calcium Chloride,** 73-75% Flake
- **Calcium Chloride,** 73-75% Solid
- **Camphor Monobromated,** U. S. P.
- **Carbon Bisulphide**
- **Carbon Tetrachloride**
- **Caustic Soda,** 76% Flake
- **Caustic Soda,** 76% Solid
- **Chloroform,** U. S. P.
- **Chloroform,** Commercial
- **Chloroethylacetate**
- **Chlorohydrin**
- **Dichloromethane**
- **Ethyl Bromide**
- **Ethyl Monochloroacetate**
- **Ethylene Bromide**
- **Ethylene Chlorohydrin**
- **Ferrous Bromide**
- **Ferric Chloride Crystals,** U. S. P. or Commercial
- **Ferric Chloride Solution,** U. S. P. or Neutral
- **Ferrous Chloride,** Crystals
- **Hexachloroethane**
- **Hydrobromic Acid,** U. S. P. or Commercial
- **Indigo,** Synthetic, Powder or Paste
- **Lead Arsenate,** Powder or Paste
- **Lime Sulphur,** Powder or Solution
- **Lithium Bromide,** U. S. P.
- **Magnesium Chloride,** Fused or Flake
- **Magnesium Metal**
- **Magnesium Sulphate,** (Epsom Salt), U. S. P. or Technical
- **Methyl Salicylate,** U. S. P.
- **Midland Blue R,** Powder or Paste
- **Midland Vat Blue 5B,** 50% Paste
- **Midland Cadet Blue,** 50% Paste
- **Mining Salts** (Bromine Salts)
- **Monobromobenzol**
- **Monochloroacetic Acid**
- **Para-dibromobenzene**
- **Pentachloroethane**
- **Phenyl Acetate**
- **Phenylethyl Alcohol**
- **Phenyl Salicylate,** U. S. P.
- **Potassium Bromate**
- **Salicylic Acid,** U. S. P.
- **Sodium Salicylate,** U. S. P.
- **Strontium Salicylate,** U. S. P.
- **Sulphur Chloride,** Red
- **Sulphur Chloride,** Yellow
- **Tetrachloroethylene**
- **Tribromophenol**
- **Trichloroethane**
- **Trichloroethylene**



MIDLAND, MICHIGAN, PLANT OF THE DOW CHEMICAL COMPANY

B. F. DRAKENFELD & CO., INC.

Established 1869

50 MURRAY ST., NEW YORK, N. Y.

Cable Address
"DRAKENFELD"
New York

BRANCHES

Chicago, Ill East Liverpool, O Washington, Pa Wheeling, W. Va

---

PRODUCTS

Manufacturers and Importers of Industrial Chemicals, Metallic Oxides and Vitrifiable Colors for glassmakers, potters and enamelers.

Alumina Oxide Hydrate
Aluminum Paints
Antimony Oxide
Arsenic

Bone Ash
Boracic Acids
Borax
Bronze Powders
Bronzing Liquid

Cadmium Metal
Cadmium Sulphides
Chrome Oxides
Clay, Ball and China
Cobalt Acetate
Cobalt Carbonate
Cobalt Chloride
Cobalt Hydrate
Cobalt Linoleate
Cobalt Metal
Cobalt Nitrate
Cobalt Oxides
Cobalt Sulphate
Colors, Cement
Colors, China
Colors, Enamel
Colors, Glass
Copper Oxides
Copper Sulphate

Feldspar
Flint
Fluorspar

Glass Decolorizers
Gold Paints

Iron Chromate
Iron Oxides

Kryolith

Lepidolite

Manganese Oxides
Metal Leaf

Nickel Anodes
Nickel Carbonate
Nickel Metal
Nickel Nitrate
Nickel Oxides
Nickel Sulphate
Nickel Ammonium Sulphate

Paris White, Cliffstone
Powder Blue
Putty Powder

Rutile

Selenium
Selenium Oxychloride
Sodium Selenite

Tin Oxide
Titanium Oxide

Uranium Oxide

Whiting

Zinc Oxides

E. I. DU PONT DE NEMOURS & CO., INC.

Dyestuffs and Dyestuff Intermediates
Acids, Heavy Chemicals and Chemical Products

WILMINGTON, DELAWARE

PRODUCTS

Dyestuffs

Dyestuff Intermediates .... **Pages 1116-7**
Acids .... **Page 1118**
Heavy Chemicals .... **Page 1118**
Pharmaceuticals .... **Page 1118**
Chemical Products .... **Page 1118**

DYESTUFFS SALES DIVISION

Wilmington, Del.

DYESTUFF INTERMEDIATES

For Making Synthetic Dyestuffs, Accelerating the Vulcanization of Rubber and for the Flotation of Copper, Zinc, Lead and Silver Ores.

Years of intensive chemical research, together with the unrivaled resources which enable us to command the finest available raw materials, manufacturing facilities and technical skill, have made it possible to produce an unusually complete variety of dyestuff intermediates that are uniform in quality of the highest standard.

The following specifications for a few of these products selected at random are typical of the rigid requirements that all our goods are obliged to meet before being offered for sale. Despite the fact that these materials now approximate or exceed the ideal commercial purity, as based upon prevailing standards, we have by no means stopped progress toward the achievement of still higher grade chemicals.

For those desiring additional facts, we have published a booklet entitled, **"Dyestuff Intermediates,"** which describes the properties and uses of nearly forty compounds of this type. Information of the same nature can be promptly supplied regarding any substances of recent development, such as anthranilic acid, anthraquinone, ortho-nitroanisole, ortho-anisidine, phthalic anhydride and mixed-xylidines.

Alpha-Naphthylamine $C_{10}H_7NH_2$

Properties—A light pink, crystalline solid having a slightly offensive odor. Its purity approximates 98 to 99%, while the freezing-point ranges from 45° to 45.5°C or higher. The product contains no iron, not more than a trace of moisture, less than 2% of beta-naphthylamine, is completely soluble in dilute hydrochloric acid and produces a clear diazo solution.

Uses—Du Pont alpha-naphthylamine is highly satisfactory for the manufacture of all dyestuff intermediates and colors, as well as for use by the textile industry in developing dyes on the fibers of cloths. We can supply either the refined or crude grades when required for the flotation of copper, zinc, silver, lead and other ores.

Aniline $C_6H_5NH_2$

Properties—A clear, faintly yellow, limpid liquid possessing an aromatic odor. Its purity is guaranteed to be not less than 99.5% and averages about 99.7%. The specific gravity at 15.5°C lies between 1.025 and 1.028, while 95% of the material distills within a range of 1.5°C, which includes its true boiling-point of 184.4°C. It contains not more than 0.25% of moisture, no hydrogen sulfide and not over 0.10% of nitrobenzene.

Uses—There exists a great variety of uses for Du Pont aniline in the dyestuff, textile, rubber and explosive industries. Because it is the highest grade manufactured on a commercial scale, superior results are obtained when it is employed for synthesizing the artificial dyestuffs and other intermediates, as well as when utilized for producing aniline black directly on textile fibers. Rubber goods manufacturers find it highly efficient for accelerating the vulcanization of rubber. Aniline can be converted into several high explosives and also diphenylamine, the stabilizer for military smokeless powders.

Benzidine (Base) $H_2N\,C_6H_4{-}C_6H_4\,NH_2$ 4.4′

Properties—Can be furnished as a dry powder or in paste form, the latter averaging 55% solids and 45% water. Benzidine (base) has a pale, reddish-purple color with little or no odor. On the dry basis, it assays 98% or higher in purity and possesses a melting-point range of 125° to 127.5°C. The ash content averages 0.7%, but does not exceed 1.5%, the moisture content is less than 1% and there is present from none to only a faint trace of matter insoluble in dilute hydrochloric acid.

Uses—Benzidine (base) is employed chiefly for the manufacture of azo dyestuffs.

Dimethylaniline $C_6H_5N(CH_3)_2$

Properties—A pale yellow, transparent liquid having an aromatic odor that is somewhat sharp and offensive. It analyzes not less than 99.5% in purity, has a specific gravity at 15.5°C of 0.956 to 0.958 and freezes slightly above 1.0°C. The fraction from 5% to 100% distills within a range of 3°C, which includes the true boiling point of 194°C. The product contains no methyl alcohol, methyl chloride or aniline, only a trace of moisture and from none to a maximum of 0.5% monomethylaniline.

Uses—The methylene colors, such as Methyl Violet, Methyl Green, Methyl Orange and Methylene Blue as well as Malachite Green and Auramine are derived from dimthylaniline. It is also valuable as a rubber vulcanizing accelerator, for the manufacture of the high explosive, "Tetryl" (trinitrophenylmethylnitramine), and is the source of the important dyestuff intermediate known commercially as Michler's ketone.

Dinitrobenzene $C_6H_4(NO_2)_2$ 1·3

Properties—Light yellow crystals, which possess little or no odor and test not less than 98.5% in purity, there being practically none of the ortho and para isomers present. The minimum freezing-point is 85°C. The product is free from acids, alkalis and oily impurities such as unconverted nitrobenzene. We usually offer dinitrobenzene with a water content of 15 to 20%, this moisture mixing mechanically with the crystals to form small lumps or pellets.

Uses—The intermediate is used almost entirely for the manufacture of meta-nitroaniline and meta-phenylenediamine. It has been reported that in the recent war Germany used dinitrobenzene as a shell charge instead of trinitrotoluene or picric acid.

Continued on Next Page

Dinitrotoluene $C_6H_3CH_3(NO_2)_2$ 1:2:4

Properties—Very light yellow monoclinic crystals, at least 95% of which pass a standard 20 mesh screen. The product has a freezing-point of 66° to 68°C., contains not over 0.005% of sulfuric acid; not more than 0.2% of moisture, a maximum of 0.05% ash and is free from oily impurities.

Uses—Du Pont dinitrotoluene is recognized as the market standard to which all others are compared. It gives exceptionally satisfactory results when converted into meta-toluylenediamine, which is used for the preparation of azo dyestuffs and sulfur colors. The military high explosive, trinitrotoluene, popularly known as TNT, may be made by the further nitration of dinitrotoluene.

Diphenylamine $(C_6H_5)_2NH$

Properties—White to slightly yellow crystals having a pleasant aromatic odor. The purity averages 99.5% or higher, while the freezing-point lies between 51.5° and 53°C. It is neutral or slightly alkaline in reaction, does not leave over 0.02% of residue when dissolved in a mixture of alcohol and ether; never contains more than 0.3% of water soluble matter nor more than 0.025% of unconverted aniline. When treated with concentrated sulfuric acid, our diphenylamine produces a clear, colorless or only pale green fluorescent solution.

Uses—One of the most important uses for diphenylamine, apart from the synthesis of other intermediates and various dyestuffs such as the Sulfur Blues, Orange IV, Metanil Yellow and Helvetia Blue, is to stabilize military and naval smokeless powders.

H Acid (1-Amino-8-Naphthol-3:6-Disulfonic Acid)

$C_{10}H_4NH_2(SO_3H)_2OH$ 1:3:6:8

Properties—We offer the monosodium salt of H acid, having a molecular weight of 341.3, in dry powdered or paste form, the latter consisting of about 50% solids and 50% water. On the dry basis, the product averages 80% in purity, is completely soluble in a saturated solution of sodium carbonate, and never contains more than a trace of Koch or chromotropic acids. The amount of iron present never exceeds 0.05%, while the bulk of the 20% of foreign matter in the dry material is composed largely of sodium chloride and sodium sulfate.

Uses—The consumption of H acid is confined largely to the manufacture of a wide range of important azo dyestuffs.

Ortho-Toluidine $C_6H_4CH_3NH_2$ 1:2

Properties—The color, odor and physical appearance of this chemical are very similar to those of aniline. The purity ranges from 98 to 99%, the remaining 2 or 1% being composed largely of para-toluidine. The specific gravity at 15.5°C is about 1.003, while the fraction from 5 to 95% distills within less than 1°C, which range includes the true boiling-point of 199.7°C. The commodity is completely soluble in dilute hydrochloric acid, contains no tarry residues, unconverted nitrotoluene or acids and not more than 0.3% moisture.

Uses—In addition to the usual consumption of ortho-toluidine in the dye industry for color manufacture, this chemical is also finding considerable favor as an agent for the recovery of ores by the flotation process and as an accelerator for the vulcanization of rubber.

Para-Nitrotoluene $C_6H_4CH_3.NO_2$ 1:4

Properties—This intermediate occurs in the form of pale yellow crystalline granulations having the characteristic odor of an aromatic nitro compound. The freezing-point is not below 50.5°C, while the melting-point lies between 50.5° and 51.1°C. These values indicate a purity of 98% or higher. It is free from ash, oily impurities and acids, contains not over 0.3% of moisture and from 0.5% to not above 1.5% of ortho-nitrotoluene.

Uses—It is used for making para-toluidine, para-nitrobenzaldehyde and para-nitrotoluene-ortho-sulfonic acid, the last of which is the fundamental intermediate for the stilbene colors.

Para-Toluidine $C_6H_4CH_3NH_2$ 1:4

Properties—White to light yellowish-brown crystals, which melt not lower than 42.8°C and freeze or congeal at a minimum temperature of 42.5°C. The purity ranges from 98 to 99%, the remaining 2 or 1% of foreign matter being made up chiefly of ortho-toluidine. It is completely soluble in hydrochloric acid, entirely free from ash and oily isomers and never contains over 0.3% of moisture.

Uses—Para toluidine is employed chiefly for making meta-nitro-para-toluidine, dehydrothio-para-toluidine, Primuline, Magenta and several other colors.

Sodium Naphthionate (Sodium 1-Naphthylamine-4-Sulfonate)

$C_{10}H_6NH_2SO_3Na$ 1:4

Properties—An exceptionally high-grade product having the formation of nearly colorless to amethyst crystals, which gradually turn light purple in storage. While dry to touch it contains about 22.7% of water of crystallization. An anhydrous sample averages at least 99 to 99.5% in purity and may contain from 0.05 to 0.11% of alpha-naphthylamine. The insoluble matter, comprising calcium and magnesium carbonates, never exceeds and is usually much less than 0.5%.

Uses—Du Pont sodium naphthionate may be used with equally good results wherever the best quality naphthionic acid is required. It is consumed in the manufacture of an extensive variety of dyestuffs.

Sulfanilic Acid (Para-Aminobenzenesulfonic Acid)

$C_6H_4NH_2SO_3H$ 1:4

Properties—A slate-gray powder guaranteed to have a sulfanilic acid content of at least 97 to 98%. The negligible impurities are mainly 0.2 to 1.0% of aniline sulfate and about 1.0 to 1.5% of insoluble matter.

Uses—Sulfanilic acid is an ingredient of many azo dyes and may be refined immediately prior to use by forming the sodium salt and filtering.

Tolidine (Base) 4:3 $H_2N.H_3C.C_6H_3$-$C_6H_3.CH_3.NH_2$ 3′:4′

Properties—A slate-gray paste made up of nearly equal percentages of solids and water. On the dry basis, the material tests 95 to 98%, with an ash content of less than 1% to not more than 4%. The ash is chiefly sodium chloride and sodium sulfate. Our tolidine contains none to a faint trace of iron and occasionally very small amounts of complex organic impurities.

Uses—Tolidine (base) is used for the same general class of dyes as benzidine. While the tolidine colors are not appreciably faster to fading influences, they are more brilliant and have a bluer shade than those derived from benzidine.

Continued on Next Page

ACIDS AND HEAVY CHEMICALS SALES DIVISION

Wilmington, Del.

Branch Offices

Philadelphia, Pa.
3500 Grays Ferry Road
Telephone Oregon 7950

Newark, N. J.
240 Vanderpool Street
Telephone. Waverly 4670

PRODUCTS

Acids
Alums
Heavy Chemicals

ACIDS

Acetic Acid
Commercial, Redistilled, Pure and Glacial.
All strengths, in barrels and carboys.

Dipping Acid
In carboys (special formulas, if desired).

Muriatic Acid
All strengths, in carboys and tanks.

Nitric Acid
All strengths, in carboys.

Aqua Fortis
All strengths, in carboys.

Sulfuric Acid
All strengths.

Oil of Vitriol (Sulfuric Acid 66°).
In tank cars, drums and carboys.

Oleum
All strengths up to 65% free SO_3.

Electrolyte (Storage Battery Acid).
Guaranteed to be made from pure brimstone Sulfuric Acid and distilled water. All strengths, in carboys.

Mixed Acid
Upon specifications.

Battery Solutions
For Lee-Fuller or other batteries.

Lactic Acid—22%, 44% Dark, 22%, 44% and 75% Light (by weight) and Edible 50% (by volume). Special Light Refined, Light Refined, Dark Commercial and Edible.

The very best products manufactured.

For use in the leather, textile, food and other industries, and many other purposes which will be explained on application.

ALUMS

Crystal Potash, U.S.P.
Lump, Ground and Powdered.

Crystal Ammonia, U.S.P.
Lump, Ground and Powdered.

Also special makes of Alums for color-makers, paper-makers, etc.

Filter Alum
For use in any make of mechanical filter. In municipal water works, Du Pont Concentrated Filter Alum (22% Al_2O_3) is specified wherever waters of high turbidity and low alkalinity present unusual filtration problems.

Pearl Alum
Pickle Alum
Porous Alum
Iron-free, lump and ground.
Sizing Alum
Sulfate of Alumina
In barrels and bags.
All the commercial grades and strengths, as well as specially concentrated products, containing 22% Al_2O_3 equivalent to 73% Sulfate of Alumina, of which we are the sole manufacturers.

MISCELLANEOUS PRODUCTS

Acetate of Lead (Sugar of Lead)
White and Brown.
Acetate of Soda
Granulated and Crystal.
Aqua Ammonia
All strengths, in drums and carboys.
Barium Chloride
Barium Nitrate
Bauxite
Bichromate of Soda
Distilled Water
For storage batteries or any other purpose where a pure water is required
Nitrite of Soda
Noted for its quality and evenness of strength and color.
Salt Cake
Strontium Nitrate
Strontium Carbonate

CHEMICAL PRODUCTS DIVISION

Wilmington, Del.

PRODUCTS

Amyl Acetate
Refined Fusel Oil
Ethyl Acetate
Ether, U.S.P.
Ether, Anesthesia
Ether, Laboratory
Pyroxylin

Pyroxylin Solutions, including
- Aeroplane Dope
- Base Solutions
- Bronzing Liquids
- Collodion, U.S.P.
- Collodion, U.S.P., Flexible
- Enamels
- Lacquers, for wood or metal
- Leather Substitute Solutions
- Mantle Dips
- Patent Leather Solutions
- Split Leather Solutions

Bronze Powder.

THE EAGLE-PICHER LEAD COMPANY

208 SOUTH LASALLE ST., CHICAGO, ILL.

BRANCH AND SALES OFFICES

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Codes
ABC, 5th Edition
Bentley's

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Cincinnati, O
Chicago Ill
St Louis Mo
Joplin, Mo
Newark, N J
Galena, Kan
Henryetta Okla
Hillsboro Ill
Argo, Ill

PRODUCTS

Lead Pigments (Dry)

Corroded White Lead (Old Dutch Process)
Sublimed White Lead
Sublimed Blue Lead
Litharge
Red Lead
Orange Mineral
Special Lead Oxides

Lead Pigments ground in Linseed Oil

Corroded White Lead (Eagle Brand)
Sublimed White Lead (Picher Brand)
Sublimed Blue Lead (Picher Brand)
Red Lead (Eagle-Picher Brand)

Metal Products

Soft Missouri Pig Lead
Refined Pig Lead
Antimonial Pig Lead
Babbitt Metals
Solders
Lead Wire and Rod
Ingot Lead
Lead Wool
Lead Bottles
Sheet Lead
Lead Pipe and Tubing
Block Tin Pipe and Tubing
Tin Wire, Tape and Ribbon
Slab Zinc

Miscellaneous

Zinc Oxide
Lithopone
Sulfuric Acid, 60° (Tank cars only)

WHITE LEAD, DRY

Eagle Brand White Lead (Basic Lead Carbonate) is produced by the "Old Dutch Process." It is exceedingly uniform in composition and free from impurities and adulterants.

White Lead is used extensively in Ceramics; the manufacture of Chemical Compounds, Enameled Ware, Paints and Putties, Pharmaceutical Compounds, Rubber, Shade Cloth, Textiles, and Wall Paper.

WHITE LEAD IN OIL

Eagle Brand White Lead Ground in Pure Raw Linseed Oil is used not only for Painting and Decorating, but also as a Lubricant for Stamp-presses and other similar purposes.

LITHARGE

Eagle-Picher Litharge is a pure Lead Monoxide, free from other lead oxides.

Litharge is used in the manufacture of Storage Batteries, Glass, Rubber, Insulated Wire, Linoleum, Colors, Inks, Driers, Insecticides, Acid-resisting Cements, Varnishes; in Enameling, Assaying and Cyaniding, and in the Refining of Petroleum Oils.

RED LEAD

Picher Red Leads (Minium) are specially pure Oxides of Lead, long favorably known for their uniformity.

Red Lead finds its principal uses in the manufacture of Storage Batteries, Paints, Glass, Enameling, Ceramics, and is also used in the manufacture of Colors, in the Rubber Industry and also in the production of Lead Peroxide.

Red Lead ground in oil (Eagle-Picher Brand) is the most universally used Metal Protective Paint. It is also used as a Pipe and Joint Lute.

SUBLIMED WHITE LEAD

Picher Sublimed White Lead (Basic Lead Sulfate) is the indispensable ingredient of all Mixed Paints. It is also used in considerable amounts in the Rubber Industry and in production of Oil Cloth, Shade Cloth, etc.

Sublimed White Lead in Oil is particularly adapted for the painting of chemical plants as it is gas resistant, chemically inert and highly rust inhibitive.

SUBLIMED BLUE LEAD

Picher Sublimed Blue Lead is a fumed product produced exclusively from galena. It is used as the base pigment in the manufacture of Metal Paints and in the Rubber Industry.

Sublimed Blue Lead in Oil is the ideal paint for structural metals. It weathers to a steel-gray color, and is highly gas resistant and unequaled for rust inhibition.

LITHOPONE

Eagle-Picher Lithopone, Sterling Brand, a very fine white pigment, is an exceptionally uniform product.

Lithopone is used in the production of Paints, Enamels, Linoleum, Shade Cloth and in the Rubber Industry.

ORANGE MINERAL

Picher Orange Mineral is used in the production of dry colors and paints and in the manufacture of Printing Inks.

EASTERN TALC COMPANY

45 Milk Street
BOSTON 9, MASS.

MINES AND MILLS
Rochester, Vermont
East Granville, Vermont

RESERVE PROPERTIES
Cambridge Junction, Vermont
Johnson, Vermont
Stockbridge, Vermont

PRODUCTS

Talc (Soapstone, French Chalk)

DEFINITION

Talc, the mineral, occurs in a solid mass although usually so soft that it can be easily carved with a penknife. Chemically it is hydrated magnesium silicate, the ideal being represented by the approximate formula:

Silica (SiO_2)	63.5%
Magnesium Oxide (MgO)	31.7%
Water of Crystallization (H_2O). ...	4.8%

In nature, however, there are no deposits of chemically pure Talc. In some certain impurities exist and in others entirely different ones, or in varying amounts. At times these impurities occur as mechanical mixtures and can be removed by mechanical means. The physical formation also varies widely, different deposits showing an essentially granular, foliated, or fibrous construction.

PRODUCTION METHODS

The large consumption of talc is in the powdered form and production of commercial talc consists principally in reducing the native mineral to greater or less impalpability through various crushing and grinding processes. Air separation and air flotation complete many of the finer grades, these methods having largely superseded bolting.

CHARACTERISTICS AND USES

Among the chief characteristics of talc are its chemical stability, and its high resistance to the passage of heat and electricity. These properties will doubtless suggest to the chemist many possible uses for which it has up to this time been little or not at all employed both as substitute for other minerals and for certain organic materials in whole or part. As a filler the general use of talc is probably as extensive as that of any other known mineral. The growth of its adaptation to various uses in many and varied lines of manufacture—in each instance arising from a limited original use for one sole purpose—makes the field for further investigation seem very promising—ceramics, cements, plaster, paints and pigments being suggested. Paper, rubber, and textiles have been gone into extensively with enormous application to all. Various toilet preparations consume considerable quantities.

ALTERNATIVE TERMS

Soapstone is frequently used as a synonym for talc, particularly the varieties which in powdered form have an unctuous, slippery feel, but the term has no very definite application. In the massive natural form soapstone is a rock composed of various minerals, talc being the principal in most occurrences. "French Chalk" is a term often used in the same connection. This unctuous quality gives to such forms of talc a distinct lubricating value similar to graphite, for which it is often substituted. It is frequently used for lubricating effect where cleanliness is a prime requisite, precluding the use of graphite or oils.

There are still other terms which properly describe only talcs of particular characteristics.

SERVICE

Our Company has cooperated with many manufacturers in working to a successful conclusion new uses for and the adaptation of talc to their processes. We are prepared to extend such cooperation at any time and shall welcome the submission of your problems.

An interesting list of many of the uses for Talc will be found in a general representation on page 1193 of this volume.

ELECTRO BLEACHING GAS COMPANY

18 EAST 41ST STREET, NEW YORK, N. Y.

Chicago Office 11 South La Salle Street
Plant, Niagara Falls, N. Y.

PRODUCT

Liquefied Chorine Gas

MANUFACTURE

As manufactured by this company this is a highly purified chlorine for use in textile, chemical and paper industries, and for the treatment of water and sewage. By refrigeration and compression it is liquefied and placed in containers of a size suitable for the individual requirements of the consumer. The chemical analysis of liquid chlorine shows it to be practically pure chlorine gas.

ANALYSIS

Chlorine	99.80% to 99.99%
Carbon Dioxide	0.01% to 0.20%
Air and Oxygen	0.00% to 0.10%

PHYSICAL PROPERTIES

Chlorine is a gas of greenish-yellow color with a pungent odor. Specific gravity of 2.49, atomic weight 35.45. Under a pressure of 6 atmospheres at 0° C. it forms a clear yellow liquid of sp. gr. 1.44. The pressure of the gas varies with the temperature from atmospheric pressure at 31.7° C. to 170 pounds per square inch at a temperature of 60° C. The specific gravity of the liquid decreases from 1.4690 at 0 C. to 1.2000 at 80° C.; the average coefficient of expansion being 0.002260. The latent heat of chlorine is 67.4 calories at 22° C.

Liquid chlorine is shipped in steel cylinders containing approximately 100 and 150 pounds respectively, one ton containers, and in tank-cars holding approximately 30,000 pounds. Where the latter are desired, it is necessary to have proper storage facilities at the plant where the chlorine is to be used.

Liquid chlorine is used for the production of many chemical compounds.

In the textile industry, liquid chlorine is used for bleaching linen; cotton, raw or spun, artificial silk hosiery; knit and print goods. In this industry, the convenience and simplicity of operation with the far superior results obtained have won for liquid chlorine an enviable reputation.

In the pulp and paper industry, liquid chlorine is extensively used in making bleach liquor, the gas being applied at the base of a small absorption tower through which a milk of lime solution circulates, the chlorine and lime combining to form calcium hypochlorite. Its advantages are rapid settling, with very small sludge losses; increased bleach production with no additional equipment; standard strength solutions; no loss of chlorine in transportation. Operating conditions are simple and agreeable and this process is the logical answer to all troubles encountered in the use of chloride of lime.

Liquid chlorine is employed for the sterilization of public water supplies to eliminate disease producing bacteria, especially those responsible for typhoid fever, also for the disinfection of sewage and of the wastes from hides and skins imported from anthrax infested countries. By the medical fraternity it is used in small ampules for individual use or in standard cylinders for hospitals in the preparation of Carrell-Dakin solutions for the disinfection of wounds.

Metallurgically, liquid chlorine is used in the reduction of cobalt and nickel and the refining of gold and platinum.

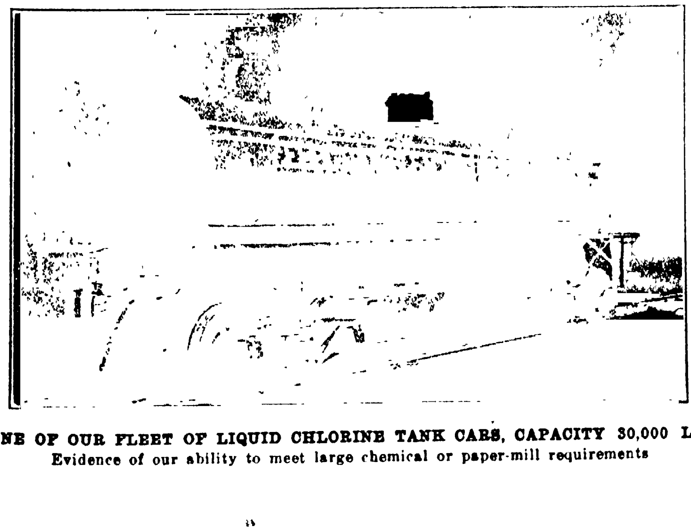
Liquid chlorine and its by-products are manufactured in a plant covering over ten acres and containing 228,325 square feet of floor space.

All processes have been brought to a high state of efficiency and the result is a product which for purity, uniformity and effectiveness leaves nothing to be desired, while the vast number of containers at our disposal and efficient handling facilities place us in a position to render an unapproachable service.

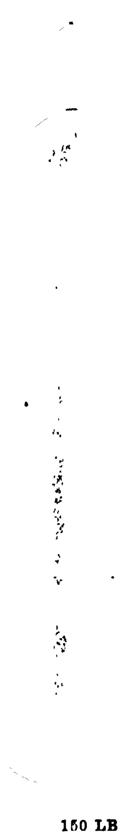
This company maintains a competent technical staff and research laboratory which is at your disposal in furnishing all information concerning the use of this product for any particular purpose.

INQUIRIES

Address all inquiries to New York Office.



ONE OF OUR FLEET OF LIQUID CHLORINE TANK CARS, CAPACITY 30,000 LB.
Evidence of our ability to meet large chemical or paper-mill requirements



150 LB.
CYLINDER WITH CAP
Total Height, 53 in.
Diameter, 10½ in.

THE FRIES & FRIES CO.

1501-1513 W. SIXTH STREET, CINCINNATI, OHIO

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PRODUCTS

Synthetic Aromatic Chemicals, Essential Oils, Pyroxylin Solutions, Solvents, Perfumers' Raw Materials, Natural and Synthetic Flavors, Certified Food Colors, True Fruit Flavors, Caramel Coloring.

SYNTHETIC AROMATIC CHEMICALS

Ethers and Esters

- Amyl Acetate
- Amyl Butyrate
- Amyl Benzoate
- Amylphenyl Acetate
- Amyl Salicylate
- Amyl Caproate
- Amyl Valerate
- Amyl Propionate
- Amyl Isobutyrate
- Amyl Formate
- Benzyl Acetate
- Benzyl Benzoate
- Benzyl Valerate
- Benzyl Propionate
- Benzyl Formate
- Benzyl Isobutyrate
- Benzyl Butyrate
- Butyl Acetate
- Butyl Butyrate
- Butyl Benzoate
- Butyl Anthranilate
- Butylphenyl Acetate
- Butyl Salicylate
- Butyl Caproate
- Butyl Valerate
- Butyl Propionate
- Butyl Formate
- Butyl Isobutyrate
- Ethyl Acetate
- Ethyl Butyrate
- Ethyl Benzoate
- Ethylphenyl Acetate
- Ethyl Salicylate
- Ethyl Caproate
- Ethyl Valerate
- Ethyl Propionate
- Ethyl Isobutyrate
- Ethyl Formate
- Ethyl Anthranilate
- Ethyl Cinnamate
- Ethyl Phthalate
- Ethyl-beta-Naphthol Ether
- Isobutyl Acetate
- Isobutyl Butyrate
- Isobutyl Benzoate
- Isobutylphenyl Acetate
- Isobutyl Salicylate
- Isobutyl Caproate
- Isobutyl Valerate
- Isobutyl Propionate
- Isobutyl Isobutyrate
- Isobutyl Formate
- Isobutyl Anthranilate
- Isobutyl Cinnamate
- Methyl Acetate
- Methyl Butyrate
- Methyl Benzoate
- Methylphenyl Acetate
- Methyl Salicylate
- Methyl Caproate
- Methyl Valerate
- Methyl Propionate
- Methyl Isobutyrate
- Methyl Formate
- Methyl Anthranilate
- Methyl Cinnamate
- Methyl Phthalate
- Methyl-beta-Naphthol Ether
- Benzoic Ether
- Dibenzyl Ether
- Enanthic Ether
- Geranyl Acetate
- Geranyl Formate
- Linalyl Acetate
- Linalyl Formate
- Methylheptin Carbonate
- Neroline
- Rum Ether, A.
- Rum Ether, H.
- Rum Ether, Technical Absolute
- Terpinyl Acetate
- Terpinyl Formate
- Yara-Yara

Acids

- Cinnamic
- Butyric
- Isobutyric
- Phenylacetic
- Valeric

Alcohols

- Benzyl Alcohol
- Citronellol
- Geraniol (from Citronella)
- Geraniol (from Palma rosa)
- Geraniol (from Bourbon Geranium)
- Linalool
- Nerol
- Rhodinol, F. & F.
- Rhodinol, F.
- Rhodinol, T.
- Rhodinol, No. 1
- Rhodinol, S.

Aldehydes and Ketones

- Acetophenone
- Anisic Aldehyde
- Anisole (Phenylmethyl Ether)
- Butyraldehyde
- Cinnamic Aldehyde
- Citral
- Citronellel
- Isobutyric Aldehyde
- Methyl Acetophenone
- Phenylacetaldehyde
- Violet Ketone, A.
- Violet Ketone, B.
- Violet Ketone, Alpha-beta
- Valeraldehyde

TRUE FRUIT FLAVORS

These flavors, of which we offer two distinct qualities, fill a demand that had long been insufficiently satisfied. These products are rich in flavor and aroma, and they will produce the most satisfactory results desired.

ESSENTIAL OILS, TERPENELESS

- Lemon
- Lemon, Redistilled
- Lemon, Sesquiterpeneless
- Lime
- Lime, Redistilled
- Orange
- Orange, Redistilled
- Orange, No. 40
- Orange, Sesquiterpeneless

CERTIFIED FOOD COLORS

Peerless, Powdered

- Lemon Yellow
- Golden Yellow
- Egg Yellow
- Brilliant Orange
- Blood Orange
- Burgundy Red
- Cherry Red
- Raspberry Red
- Strawberry Red
- Brilliant Rose
- Chocolate Brown
- Brilliant Green
- Mint Green
- Grape Shade
- Bright Blue
- Violet

CARAMEL, BURNT SUGAR COLORING

Liquid, will not deposit under most severe acid test, nor in alcoholic solutions up to 52½% or 105 proof. Of exceptional coloring power and brilliancy. Carload shipments if desired.

SERVICE

We are practically always in a position to ship orders, regardless of size, the same day received. We give the same careful attention to small orders as to large ones, and will accept orders for any size package from one ounce up.

Laboratory—Our Laboratory is at your service for developing flavors, odors or other items for your individual requirements. Therefore, we shall be pleased to receive your inquiries for articles not mentioned which we may be in a position to manufacture.

PRICE LIST

We shall be pleased to forward our latest price list on request. It contains a complete listing of the various flavors, colors, etc., that we produce.

THE GASKILL CHEMICAL CORPORATION

Manufacturing Chemists

Telephones
WILLIAMSBURG 1763
WILLIAMSBURG 4990

GENERAL OFFICE AND WORKS
157-159 SPENCER STREET, BROOKLYN, N. Y.

RODOL ANIMAL FIBER DYES
Trade Mark

SOLE SALES AGENTS
NATIONAL GUM & MICA CO., 59TH STREET AND 11TH AVENUE, NEW YORK, N. Y.

PRODUCTS

- **Organic Chemicals and Intermediates**
- **"Rodol" Fur Dyes**
- **"Rodol" Animal Fiber Dyes**

ORGANIC CHEMICALS AND INTERMEDIATES

- Para-Phenylenediamine
  - Distilled Lumps
  - Crystals
  - Distilled Crystals
- Para-Phenylenediamine Hydrochloride
- Ortho-Aminophenol
- Nitro-meta-Diaminoanisol
- Nitro-meta-Toluenediamine
- Para-Aminophenol
  - Base
  - Hydrochloride
- Acetyl-para-Phenylenediamine

FUR DYES

- "Rodol" AA
- "Rodol" A
- "Rodol" Gray B
- "Rodol" Gray CD
- 'Rodol" D
  - Regular Lumps
  - Distilled Lumps
  - Distilled White Crystals
- "Rodol" GG
- "Rodol" 4G
- "Rodol" DB
- "Rodol" DG
- "Rodol" Gray RB
- "Rodol" SA
- "Rodol" X
  - Loose Crystals

The "Rodol" brand of Fur Dyes has been fully developed by this company, including all the dyes of Aniline origin which are in demand among average dyers as well as several specially manufactured dyes. In respect of the latter, the shades and colors are **fast**, will not fade or rub out; and these Dyes should be used in accordance with our practical suggestions.

"Rodol" Dyes, after extensive experiments with various colorings extended over several years, retain their original shades; the results will always be identical; and they are **guaranteed to be pure goods** in all cases.

Tests—In the table below are comparison tests or dyeings on the different mordants; these should assist the prospective buyer in the selection of the particular dye required and to determine the necessity for the use of a mordant before or after the bath of the skin in the dye.

Prices and Samples—Sent upon application.

ANIMAL FIBER DYES

- Sky Blue
- Pansy Blue
- Blue Black
- Jet Black
- Sable Brown
- Stone Marten Brown
- Taupe
- Olive Drab
- Blue Gray
- Greenish Gray
- Mouse Gray
- Bright Yellow
- Dull Yellow

"Rodol" Animal Fiber Dyes dye Furs, Feathers, Hatter's Fur, and Silk in a cold bath by process of oxidation.

We have successfully worked out blends which give natural colors, characteristic in every respect with nature's own coloring found on animals and birds, all of which can be produced on Fur, Feathers, Hatter's Fur, and Silk.

"Rodol" Dyes are made in the U. S. A. They are unequaled in quality, and cheapest in use.

COOPERATIVE SERVICE

We operate a confidential manufacturing service which is at the disposal of our customers, free of all costs. Full manufacturing information will be extended to interested persons by our Chemists, through whom all dyeing problems receive prompt consideration without obligation.

COMPARISON OF DIRECT AND MORDANTED DYEINGS

"Rodol" Brand Fur Dyes	Copper Mordant	Chrome Mordant	Copperas Mordant	Direct Dyeings
"Rodol" AA	Blue Black		Coal Black	Blue Black
"Rodol" A	Blue Black			Blue Black
"Rodol" D	Coal Black	Brown Black	Coal Black	Brownish Black
"Rodol" 2G	Yellow Brown	Yellow Brown	Yellow Brown	Dull Yellow
"Rodol" 4G	Light Brown	Light Brown	Red Brown	Pure Yellow
"Rodol" Gray RB	Brownish Gray	Greenish Gray	Mouse Gray	
"Rodol" P	Dark Brown	Red Brown	Gray Brown	Light Brown
"Rodol" Pyrogallic Acid	Yellow Brown	Yellow Brown	Gray Brown	Blond

GENERAL CHEMICAL COMPANY

25 BROAD STREET, NEW YORK, N. Y.

BRANCH OFFICES

Baltimore, Md.
Buffalo, N. Y.
Chicago, Ill
Denver, Colo.
Easton, Pa
Philadelphia, Pa
Cleveland, O
Pittsburgh, Pa
Providence, R. I.
San Francisco, Calif.
Seattle, Wash

Cable Address
"LYCURGUS," New York

Montreal, Canada
The Nichols Chemical Co., Ltd.

PRODUCTS

Heavy Chemicals

ACIDS

Acetic: All strengths of Commercial, Pure, Re-distilled grades. Glacial 99½% U. S. P.
Aqua Fortis.
Arsenic.
Battery. See Electrolyte.
Butyric.
Chlorosulfonic.
Electrolyte: A specially pure battery acid made by the Contact Process System.
Hydrochloric (Muriatic). Commercial and Chemically Pure.
Hydrofluoric (Also White Acid for frosting glass).
Hydrofluosilicic.
Mixed: Sulfuric and Nitric. Various formulas.
Nitric: Commercial and Chemically Pure.
Phosphoric.
Propionic 99½%.
Sulfuric: Oil of Vitriol; Oleum (Fuming) and Chemically Pure in carboys, drums, tank-trucks and tank-cars.
Valeric: Iso and Normal.

ALUMS

Ammonia Alum, U. S. P. (Ammonium-Aluminum Sulfate): Lump, Ground or Powdered form.
Sodium-Aluminum Sulfate.
Sulfate of Alumina.

ALUMINUM SULFATE

Lump, Ground, and Filter.

AMMONIA

Aqua in carboys and drums.
Bifluoride.
Hydrate. Chemically Pure.

BAKER AND ADAMSON

"B & A" Chemically Pure Reagents for Laboratories.

COPPER

Nitrate.
Sulfate (Blue Vitriol).

DIMETHYL SULFATE

INSECTICIDES

B. T. S.
Atomic Sulfur.
Arsenate of Lead.
Arsenate of Calcium.
Arsenite of Zinc.
Bordeaux Mixture.
Cattle Dip.

IRON

Nitrate: Copperas, True.
Sulfate (Copperas).
Sulfide: Commercial Lump, and for Laboratory generation of H_2S.

LEAD ACETATE

Broken, Crystal and Powder.

MAGNESIUM

Fluosilicate (Solution).
Sulfate (Epsom Salt): U. S. P. and Technical.

SODIUM

Acetate.
Bisulfate (Niter cake).
Bisulfite: Anhydrous, Powder and Solution.
Fluoride.
Hyposulfite: Crystal, Granular, Photographic grades.
Phosphate, Disodium.
Phosphate, Trisodium.
Pyrophosphate.
Silicate: Solid and Solution.
Sulfate: Salt Cake and Glauber's Salt.
Sulfide: Chipped Patented 60-62% and Crystals 30-31%
Sulphite: Crystal and Dry powdered.

SULFUR

Flour.
Flowers.
Roll (Brimstone).

TIN

Bichloride.
Crystals (Stannous chloride).
Muriate.
Tetrachloride Anhydrous.

SERVICE

Our works and distributing warehouses are so located in various sections of the country that prompt service can be obtained at a minimum freight expense.

INQUIRIES should be addressed to the nearest sales office.

EXPORT inquiries should be addressed to

GENERAL CHEMICAL COMPANY,
Export Department,
25 Broad Street,
New York, N. Y., U. S. A.

THE GASKILL CHEMICAL CORPORATION

Manufacturing Chemists

Telephones
WILLIAMSBURG 1763
WILLIAMSBURG 4990

GENERAL OFFICE AND WORKS
157-159 SPENCER STREET, BROOKLYN, N. Y.

Trade Mark

SOLE SALES AGENTS
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  - Distilled Lumps
  - Crystals
  - Distilled Crystals
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- Nitro-meta-Toluenediamine
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  - Base
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- Acetyl-para-Phenylenediamine

FUR DYES

- "Rodol" AA
- "Rodol" A
- "Rodol" Gray B
- "Rodol" Gray CD
- "Rodol" D
  - Regular Lumps
  - Distilled Lumps
  - Distilled White Crystals
- "Rodol" GG
- "Rodol" 4G
- "Rodol" DB
- "Rodol" DG
- "Rodol" Gray RB
- "Rodol" SA
- "Rodol" X
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Tests—In the table below are comparison tests or dyeings on the different mordants; these should assist the prospective buyer in the selection of the particular dye required and to determine the necessity for the use of a mordant before or after the bath of the skin in the dye.

Prices and Samples—Sent upon application.

ANIMAL FIBER DYES

- Sky Blue
- Pansy Blue
- Blue Black
- Jet Black
- Sable Brown
- Stone Marten Brown
- Taupe
- Olive Drab
- Blue Gray
- Greenish Gray
- Mouse Gray
- Bright Yellow
- Dull Yellow

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"Rodol" 2G	Yellow Brown	Yellow Brown	Yellow Brown	Dull Yellow
"Rodol" 4G	Light Brown	Light Brown	Red Brown	Pure Yellow
"Rodol" Gray RB	Brownish Gray	Greenish Gray	Mouse Gray	
"Rodol" P	Dark Brown	Red Brown	Gray Brown	Light Brown
"Rodol" Pyrogallic Acid	Yellow Brown	Yellow Brown	Gray Brown	Blond

HARMON COLOR WORKS, INC.

Manufacturers of Chemical Pigment Colors

COLLEGE POINT, NEW YORK, N. Y.

Cable Address
"HARPOINT", New York

PRODUCTS

Chemically Pure Greens

- LLL
- LL
- L
- M
- D
- DD

Harpoint Grinding Greens

- LL
- L
- M
- D
- DD

Harpoint Grinding Greens No. 2

- LL
- L
- M
- D
- DD

Export Greens

- L
- M
- D

Chemically Pure Yellows

- LLL
- LL
- L
- M
- O
- DO
- DDO

Reduced Grinding Yellows

- L
- M
- O

Export Yellows

- L
- M
- O

Chemically Pure Blues

- Prussian
- Chinese
- Bronze
- Milori
- Soluble

Para Reds

- Toners
- Reduced Paras

Vermilions

Special shades of all type colors made to order.

QUALITY

Harmon Chemical Pigment Colors are fully guaranteed as to uniformity and tinctorial strength. They are invariably clear and brilliant, as well as free from impurities.

USES

Our colors are used in products such as:

- Auto Paints
- Barrel Paints
- Bicycle Paints
- Bluing
- Bridge Paints
- Carbon Paper
- Coated Paper
- Colors in Japan
- Colors in Oil
- Crayons
- Deck Paints
- Enamel Paints
- Enameling Paints
- Flat Wall Paints
- Floor Paints
- Floor-coverings
- House Paints
- Implement Paints
- Iron and Steel Paints
- Kalsomine
- Leather
- Leather Dressings
- Linoleum
- Lithographic Inks
- Marine Paints
- Oil-Cloth
- Oil Stains
- Pencils
- Porch Paints
- Printing Inks
- Mechanical Rubber
- Shade Cloth
- Shoe Polish
- Shingle Stains
- Ship Paints
- Textiles
- Tin Plate
- Wagon Paints
- Wall Paper

PRODUCTION

Our Pigment Colors are produced by formulas which have been thoroughly tested by many years of successful use after careful standardization.

COLOR-MATCHING

Our complete facilities for color-matching are always available for use by our customers. Any color or shade can be duplicated by means of these facilities.

SERVICE

We are constantly adding new colors to our line and solicit your inquiries regarding any products not mentioned specifically. Our well equipped laboratories are at your service, and your problems are welcomed. This laboratory service, as well as samples and quotations, are gladly furnished without obligation.

STOCKS AND SHIPMENTS

We maintain sufficiently large stocks to make prompt shipments at all times. We use the standard packages, but shall be glad to arrange for the use of special sizes on request.

THE GASKILL CHEMICAL CORPORATION

Manufacturing Chemists

Telephones
WILLIAMSBURG 1763
WILLIAMSBURG 4990

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"Rodol" Pyrogallic Acid	Yellow Brown	Yellow Brown	Gray Brown	Blond

THE HELLER & MERZ COMPANY

MAIN OFFICE: 505 HUDSON STREET, NEW YORK, N. Y.

TRADE MARK

BRANCHES

Boston, Mass., 287 Atlantic Ave
Chicago, Ill., 109 West Austin Ave
Philadelphia Pa., 114 Market St.
Springfield, Mass., 24 Lester St

Cable Address
"MERZ", New York
Codes
ABC, 5th & 6th Editions
Directory
Bentley's
Lieber's

PRODUCTS

- **Ultramarines**
- **Barrel Paints**
- **Pigment Colors**
- **Coal-tar Colors**

ULTRAMARINE DEPT.

- Ultramarine Blue Powder
- Ultramarine Blue Pulp
- Ultramarine Blue Drops
- Ball Blue
- Square Blue

BARREL PAINT DEPT.

- Paste
- Liquid
- Dry

PULP DEPT.

- Pigment Colors in paste form

SUNDRIES

- Sap Brown
- Oxide of Iron
- Ochre
- Pigment Black
- Umber
- Sienna
- Soluble Blue

ANILINE DEPT.

- Acid Colors
- Basic Colors
- Direct Colors
- Colors Soluble in Oil
- Butter Color
- Beta-Naphthol
- Sulphanilic Acid

We are the Pioneer manufacturers on this continent of

- Bromo Fluorescein
- Eosine
- Erythrosine
- Phloxine
- Rose Bengale

Our standards are second to none.

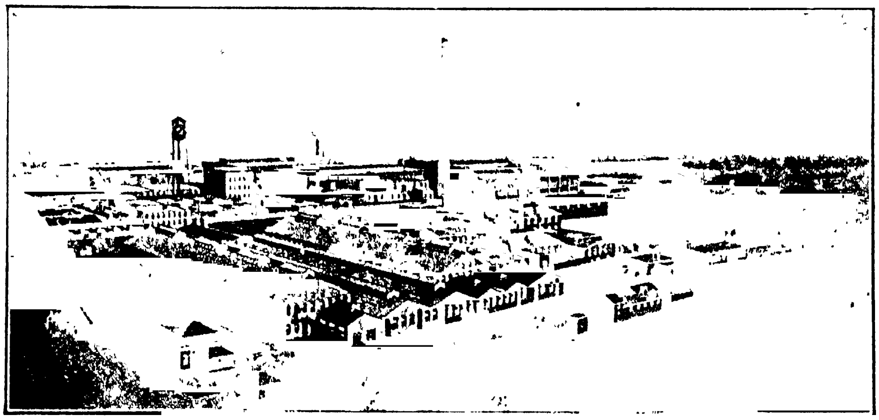
GUARANTEE

We guarantee our goods to be of highest quality and to run entirely uniform.

SERVICE

Half a century's experience enables us to satisfy the wants of consumers.

The service of our laboratories in Newark, N. J., and New York and of our demonstrators is unexcelled.



WORKS OF THE HELLER & MERZ CO., NEWARK, N. J.

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MORRIS HERRMANN & CO.

Dry Color Makers
200 FIFTH AVENUE, NEW YORK, N. Y.

Cable Address
"RUNRUN", New York
WORKS
Newark, N J

PRODUCTS

Dry Pigment Colors, Lakes, Pulp Colors, Paris Green, Earth Colors.

DRY PIGMENT COLORS

- Blues
  - American
  - Bronze
  - Celestial
  - Cerulean
  - Chinese
  - Iridescent
  - Milori
  - Prussian
  - Soluble
  - Turquoise
- Greens
  - C. P.
  - Grinders'
  - Jobbers'
  - Limeproof
  - Paris
- Yellows
  - C. P.
  - Commercial
  - Limeproof
- Reds
  - Para
  - Process
  - Toluidine
  - Turkey
  - Lithol
- Scarlets
- Vermilions
  - English
  - American
  - Eosine
  - Para
- Toners
  - Para
  - Toluidine
  - Lithol
  - Scarlet
  - Maroon
  - Bronze Red
  - Bronze Green
  - Blue
- Whites
  - Alumina Hydrate
  - Gloss White
- Lakes
  - Geranium
  - Green
  - Blue
  - Yellow
  - Orange
  - Purple
  - Madder
  - Mauve
  - Rose
  - Brown
  - Transparent (all shades)
  - Chambertin
  - Jacque
  - Maroon
  - Lithol
  - Violet
  - Crimson
  - Carriage
- Pulp Colors
  - All of the above also made in pulp form
- Earth Colors
  - French Ocher
  - Van Dyke Brown
  - Raw Sienna
  - Burnt Sienna

USES

For Paint, Varnish and Printing Ink Manufacturers.

- Also for
  - Enamels
  - Stains
  - Kalsomine
  - Artist Tube Colors
  - Lithographing Inks
  - Marking Inks
  - Celluloid
  - Candles
  - Lead Pencils
  - Crayons
  - Rubber
  - Paper
  - Carbon Paper
  - Typewriter Ribbons
  - Cosmetics
  - Laundry
  - Sealing Wax
  - Lacquer
  - Artificial Leather
  - Oil Cloth, Linoleum
  - Scenic

QUALITY

Our aim continues to be the maintenance of the highest quality, which we believe means the greatest advantage to the consumer.

HEYDEN CHEMICAL COMPANY OF AMERICA, INC.

Manufacturers of Fine Chemicals for Medicinal and Technical Use

Cable Adress
"HEYDEN" New York

Codes
A B C 5th Edition
Western Union
Bentley's
Lieber's

GENERAL OFFICES RESEARCH LABORATORIES AND WORKS
GARFIELD, N. J.

BRANCH OFFICES
New York 135 William Street
Philadelphia 1410 North Front Street
Chicago, 180 North Market Street
St Louis 220 South Commercial Street
Kansas City Mo., 2952 Fairmount Avenue

PRODUCTS

Acetanilide, U. S. P.
Acetic Anhydride
Acetone, U. S. P.
Acid Acetic
Acid Acetylsalicylic
Acid Benzoic, U. S. P. (from Toluol)
Acid Carbolic, U. S. P. (Phenol)
Acid Hydrochloric (Muriatic)
Acid Lactic, U. S. P.
Acid Nitric, C. P.
Acid Salicylic, U. S. P., Synthetic
Acid Sulphuric
Acid Tannic
Acid Tartaric
Alum, Burnt
Alum, Chrome
Aluminum Acetate
Aluminum Sulphate, Granular, U. S. P.
Ammonia Water
Ammonium Bromide, U. S. P.
Ammonium Salicylate, U. S. P.
Amyl Salicylate, U. S. P.
Antimony Trichloride
Barium Carbonate
Bismuth Beta-naphthol, U. S. P.
Bismuth Subsalicylate, U. S. P.
Butter of Antimony (Antimony Trichloride)
Calcium Lactate
Calcium Salicylate, U. S. P.
Calomel, U. S. P.
Calomelol Ointment
Collargol (Colloidal, soluble Metallic Silver)
Creosote, U. S. P.
Creosote Carbonate, U. S. P.
Creosotal (Creosote Carbonate)
Crystallose
Duotal (Guaiacol Carbonate, Heyden)
Epsom Salt (Magnesium Sulphate)
Formaldehyde, U. S. P.
Fusel Oil (Amyl Alcohol)
Garantose
Gastrosan (Bisalicylate of Bismuth)
Gold Extender
Guaiacol, U. S. P.
Guaiacol Carbonate, U. S. P.
Hexamethylenetetramine, U. S. P.
Ichthynat (Ammonium Ichthynatum)
Injection Heyden
Lead Acetate
Lithium Benzoate
Lithium Salicylate, N. F.
Magnesium Salicylate
Menthol, U. S. P.
Mercury, Commercial
Methyl Salicylate, U. S. P. (Synthetic Oil Wintergreen)
Oil Betula (Oil Sweet Birch)
Oil Wintergreen Synthetic (Methyl Salicylate)
Omorol
Orphol (Bismuth Beta-naphthol)
Paraformaldehyde, U. S. P. (Trioxymethylene)
Paraldehyde, U. S. P.
Phenol
Phenyl Salicylate (Salol), U. S. P.
Potassium Chlorate
Potassium Permanganate, U. S. P.
Potassium, Sulphuretted
Proganol-Heyden
Prophylactic Tubes
Resorcinol, U. S. P. (Resorcin)
Saccharine, U. S. P.
Salocreol
Salol, U. S. P.
Sodium Benzoate, U. S. P.
Sodium Bromide, U. S. P.
Sodium Fluoride
Sodium Iodide, U. S. P.
Sodium Salicylate
Strontium Bromide, U. S. P.
Strontium Iodide, U. S. P.
Strontium Salicylate, U. S. P.
Tartar Emetic, U. S. P.
Unguentum Crede
Vargol-Heyden

GENERAL OFFICES, RESEARCH LABORATORIES AND WORKS, GARFIELD, N. J.

HEYL LABORATORIES, INC.

437 BARRETTO STREET, NEW YORK, N. Y.

Cable Address "HEYLABS", New York

PRODUCTS

- **Indicators, Standardized**
- **Biological Stains, Certified**
- **Medicinal Dyes**
- **Vital Stains**
- **Organic Preparations**
- **Commercial Dyes**

QUALITY

Heyl products are manufactured from the best grade of materials in a thoroughly and completely equipped laboratory under the supervision of expert and specially trained chemists.

All products are tested both biologically and microscopically. Their purity, quality, uniformity and dependability are guaranteed.

The user of Stains, Indicators and other products employed in laboratory work realizes that upon the purity, uniformity and dependability of such material depends the accuracy and authority of results obtained.

The manufacture of such products requires, first of all, purity of raw material. It demands knowledge and experience on the part of the chemists engaged in this special field. The manufacture of such products is not by any means or in any way comparable with the manufacture of dyestuffs for commercial use. The statement is sometimes made by dealers that there is no standard method of testing such products other than by actual use. That statement is contrary to fact.

Heyl Laboratories, Inc., products can be absolutely relied upon. They are the practical result of a successful attempt to specialize in the manufacture of such materials for biological use.

STANDARDIZED INDICATORS

Alizarin Red S
Azolitmine
Benzopurpurine
Cochineal
Congo Red
Coralline Red
Dimethylaminoazobenzene
Dimethylaminobenzaldehyde
Dimethylglyoxime
Diphenylamine
Eosin B
Eosin Y
Fluorescein
Fuchsin, Acid
Hematoxylin, C. P. Crystals
Iodine Eosin
Lacmoid, Alcohol soluble
Lacmoid, Water soluble
Litmus
Methyl Orange
Methyl Red
Methyl Violet
Naphthylamine Hydrochloride, Alpha
Neutral Red
Phenylhydrazine
Phenylhydrazine Hydrochloride
Phenolphthalein
Sodium Nitroprusside
Tropaeolin

These Indicators are produced from raw materials which we either manufacture ourselves or purify from commercial products. They are carefully standardized and will meet every need of the analytical chemist.

Additional Indicators will be added to our line as necessity for them arises. Special Indicators will be prepared to order.

We supply our crystallized, standardized indicators in 10 gram and 25 gram bottles. Aqueous and alcoholic solutions prepared on request.

ORGANIC PREPARATIONS

We are producing a special line of exceptionally pure, synthetic, organic compounds for biological work, such as Benzidine, Benzophenone, Dulcin, Glycogen, Monomethylaniline, Para-phenylenediamine, etc. What are your needs?

BIOLOGICAL STAINS, CERTIFIED

Alizarin Red S
Auramine
Benzopurpurine
Biebrich Scarlet
Biorupine
Bismarck Brown
Brilliant Cresyl Blue
Brilliant Green
Carminate Ammonium
Carminate Sodium
China Blue
Chrysoidine
Crystal Violet
Dahlia Violet
Eosin Y
Erythrosin
Fuchsine, Acid
Fuchsine, RFN, Basic
Gentian Violet
Indigo Carmine
Methyl Green
Methyl Violet
Methylene Blue BG
Neutral Red
Safranin O
Thionine

The important uses to which Biological Stains are put justify the extreme care with which we manufacture them, as well as the accuracy of our standardization.

Heyl Certified Biological Stains have, since being placed on sale about five years ago, gained for themselves a well-founded reputation for uniformity, brilliancy and extremely low ash content, the latter signifying the absence of more than traces of metal salts or fillers, insuring even and accurate results.

We do not certify any Biological Stain until we have assured ourselves by exhaustive tests that they are suitable for the purpose intended. Those interested may obtain from us copies of the standardization technic used.

We are in a position to produce other Biological Stains at short notice. Let us know your needs.

Heyl Laboratories, Inc., Certified Biological Stains are supplied in 1, 10, 25 and 100 gram bottles. Aqueous and alcoholic solutions prepared on short notice, also mixed stains containing two or more dyes.

MEDICINAL DYES

Acriflavine GH
Brilliant Green
Methyl Violet
Methylene Blue
Naga Red
Para-fuchsine
Proflavine GH
Provoflavine
Pyoktanine Blue
Pyoktanine Yellow
Scarlet Red
Trypan Blue
Trypan Red
Tryparosan

The use of therapeutic agents derived from dyestuffs as internal antiseptics has assumed such importance in recent years that Heyl Laboratories, Inc., made the necessary arrangements with the Chemical Foundation, Inc., the present owners of the original German patents covering the manufacture of 3 6-Diaminoacridine Salts, and the derivative, 3:6-Diamino-10-methylacridinium Chloride. We are therefore the only producers of Acriflavine GH and Proflavine GH in the United States. The two compounds are manufactured with our usual care and thoroughness, and are thoroughly tested both chemically and biologically before shipment.

HEYL SPECIALTIES

Neutral Acriflavine (Neutroflavine)
Toluidine Blue (Schultz 5th ed. No. 592)
Pyronin G (Schultz 5th ed No 568)
Methyl Green (Schultz 5th ed No 519)
Cresyl Blue (Schultz 5th ed No. 621)
Methylene Violet (Schultz 5th ed. No. 680)

LITERATURE

Write for our descriptive catalog, mentioning the class of compounds you are interested in.

EDWARD HILL'S SON & CO.

64 WALL STREET, NEW YORK, N. Y.
WESTERN OFFICE Tribune Bldg., CHICAGO, ILL.

Cable Address
"METIS," New York

PRODUCTS

- Soda Ash
- Caustic Soda
- Sodium Bicarbonate
- Arsenic, White
- Antimony
- Antimony Oxide
- Antimony Sulphide
- Tin
- Citronella Oil

Ores of
- Antimony
- Bismuth
- Manganese
- Molybdenum
- Tin
- Tungsten

SODA ASH (Na_2CO_3)

Light 58%, packed in bags of 300 lb net and barrels of 276 lb. net.

Granular Dense 58%, packed in bags of 400 lb net and in barrels of 425 lb. net

Light 58% Soda Ash is used principally in the manufacture of Soap and Cleansers, Paper, Textiles, for water softening, and for the prevention of timber mold.

Granular Dense is made especially for glass-making, being practically free from dust, making its use most economical.

CAUSTIC SODA (NaOH) 60%, 70%, 74%, 76%-78%, Solid and Ground

Solid—Packed in iron drums of 760 lb. net.

Ground—Packed in iron drums of 500 lb. net and 100 lb. net, and in hardwood casks of 550 lb net.

Caustic Soda is used principally in the manufacture of Soap, Paper, Refining Oils, Lye, Chemicals, Drugs and Dyes.

We make special high-test Caustic Soda particularly adapted for Mercerizing Cotton Yarns and in the manufacture of artificial Silk, and for use in Primary Batteries.

Ground Caustic Soda is furnished in any size grinding, to meet special requirements.

Caustic Soda Bottoms, packed in iron drums of about 900 lb. net, for use in reclaiming rubber and in the manufacture of laundry soap.

SODIUM BICARBONATE ($NaHCO_3$)

Packed in bags of 300 lbs. net.
bbls of 400 " "
kegs of 112 " "

A high grade product, conforming to the requirements of the United States Pharmacopeia and guaranteed under the Pure Food & Drugs Act; manufactured in both Powdered and Granular form; used principally in the manufacture of baking powder, drugs, carbonating beverages, and for the prevention of timber mold.

Another grade, which we call Carbonic Soda, not always so highly refined, used by bottlers in carbonating waters, charging fire extinguishers, and in the tanning industry.

SOLE SELLING RIGHTS

We are sole selling agents for the Michigan Alkali Co., Wyandotte, Michigan, for the sale of their WYANDOTTE BRAND SODA ASH, CAUSTIC SODA and BICARBONATE OF SODA.

Sole U. S. A. agents for Cookson & Co., Ltd., Newcastle-on-Tyne, England, for the following products:

- Golden Sulphuret of Antimony
- White Oxide of Antimony
- Barytes
- Antimony Metal
  - "C" Brand
  - "Tyne" Brand
  - R. M. M. Brand
- Timonox

Sole U. S. A. agents for China Mining & Metal Co., Hong Kong, China, for the sale of general line of Oriental Produce. We specialize in:

- Chinese Antimony Metal
- Chinese Antimony Crude
- Chinese Antimony Ore
- Tungsten Ore
- Manganese Ore
- Tin Ore
- Molybdenum Ore
- Bismuth Ore
- Chinese Tin No. 1, 99%
- Cassia Oil
- Anise Oil
- Peanut Oil
- Soya Bean Oil
- China Wood Oil
- Crude Camphor
- Asbestos
- Mica
- Vermilion

We also represent American and Canadian manufacturers on

Powdered White Arsenic.

HOOKER ELECTROCHEMICAL COMPANY

Established 1901

25 PINE STREET, NEW YORK, N. Y.

Cable Address
"HOOKELFC," New York
All Codes

WORKS ECHOTA, NIAGARA FALLS, N. Y.

PRODUCTS

We manufacture

- **Acetyl Chloride**
- **Aluminum Chloride, Technical Anhydrous**
- **Antimony Pentachloride, Technical Anhydrous**
- **Antimony Sulphuret, Crimson**
- **Antimony Trichloride, Technical Anhydrous**
- **Benzoyl Chloride**
- **Bleaching Powder**
- **Chlorine, Liquid**
- **Chlorobenzol, Mono**
- **Dichlorobenzol, Para-**
- **Ferric Chloride, Crystals**
- **Ferrous Chloride, Crystals**
- **Hydrochloric Acid**
  - **C. P.**
  - **Hooker White**
  - **Commercial**
- **Soda, Caustic—Solid, Ground and Powdered**
- **Sodium Benzoate, U. S. P.**
- **Solvent No. 74, A chlorinated benzol product**
- **Sulphur Chloride**
- **Sulphuryl Chloride**

TOWNSEND PROCESS

The Townsend Process is used for the Electrochemical production of Chlorine and its derivatives and Caustic Soda from ordinary salt. The valuable patents on this process, both Domestic and Foreign, which we use, are owned by us.

LITERATURE

Bulletins describing the manufacture, uses and specifications of our products, including Bleaching Powder, Caustic Soda, Hydrochloric and Muriatic Acids, Liquid Chlorine, Paradichlorobenzol and Benzoate of Soda, will be sent on request.

BLEACHING POWDER (Chloride of Lime)

Analysis: Available Chlorine...... .....35–37%

Other grades when required.

CONTAINERS

Domestic.	Approx Lb Gross	Tare	Approx Lb Net
Steel Drums	800	42	750
Steel Drums	325	26	300
Steel Drums	100	12	90
Wooden Barrels.	415	66	350

Export: From actual experience over a long period of years in export shipments Hooker drums have been developed of extra heavy steel and embody other special protective features

	Approx. Lb Gross	Tare	Approx. Cubic Feet
Steel Drums	453	53	12.1
Steel Drums	130	18	8.4
Steel Drums	58	8	1.8
Wooden Barrels	415	60	13.7

CAUSTIC SODA

Analysis: New York and Liverpool Test

Sodium Oxide.................77.7 to 77.9%

Sodium Hydrate ... .97.02 to 97.27%

Other grades when required.

CONTAINERS

Domestic: New air tight steel drums of the following weights:

	Lb Gross	Tare	Lb Net
Steel Drums	740	20	720
Steel Drums	229	9	220

Ground:	Approx Lb Gross	Tare	Approx Lb Net
Steel Drums—Domestic	427	27	400
Steel Drums	134	9	125
Wooden Barrels..	566	66	500

Export:	Lb Gross	Tare	Cubic Feet
Steel Drums	740	20	8.4
Steel Drums	229	9	6.6
Steel Drums	121	9	1.5

HOOKER WHITE MURIATIC ACID SYNTHETIC AND HOOKER C. P. HYDROCHLORIC ACID

Grades:..............18°, 20°, and 22° Beaumé

CONTAINERS

Domestic Glass carboys, boxed and packed with straw, 12 gallons, approximately 118 pounds net, 80 pounds tare

Export Square boxed glass carboys, 12 gallons approximately, 208 pounds gross, 90 pounds tare, cu ft 7.3

LIQUID CHLORINE

Analysis: Chemically pure and anhydrous.

CONTAINERS

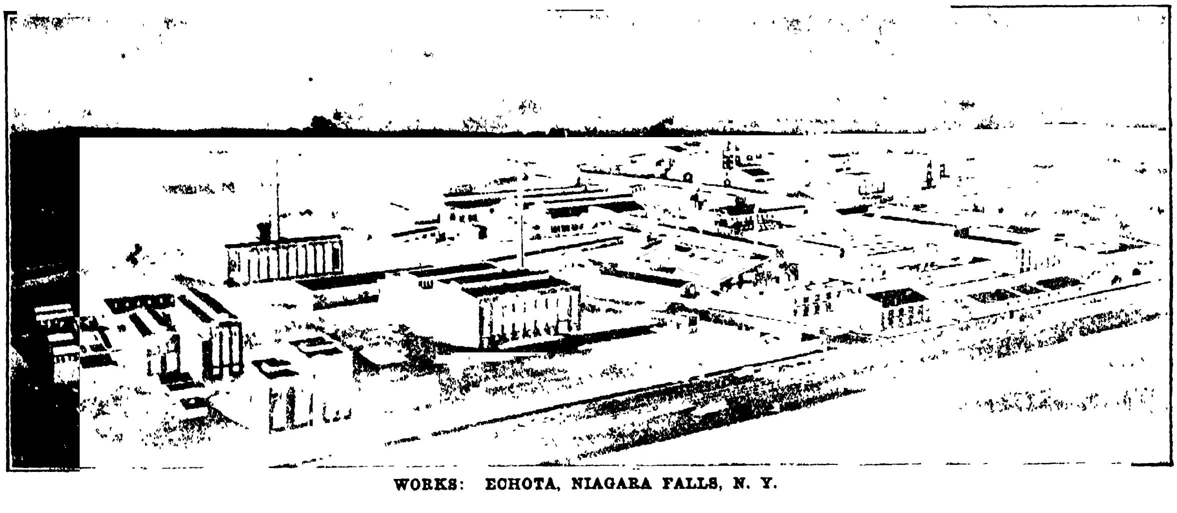
Cylinders:

Gross. .. . 200 pounds Tare 100 pounds Net . 100 pounds

Size

Outside Diameter................	8½ inches
Total Height	53 inches
Height to Valve Outlet	50 inches

Steel Cylinders complete with Valves and Protecting Caps



WORKS: ECHOTA, NIAGARA FALLS, N. Y.

HUMMEL & ROBINSON CORPORATION

Manufacturers and Importers of Industrial Chemicals, Colors and Raw Materials

26 Cortlandt Street
NEW YORK, N. Y.

AGENTS IN
Chicago, Ill
Philadelphia, Pa
Cleveland, O
San Francisco, Calif
New Orleans, La

Cable Address
"AHMUL", New York
FACTORY
Brooklyn N Y
WAREHOUSES
Hoboken, N J
Brooklyn, N Y

Trade-Mark

PRODUCTS

We are manufacturers and also represent leading European producers of approved standards of Chemicals, Dry Colors, and Specialties for the Rubber, Varnish, Paint, Leather, Textile, Glass, Pyrotechnic and Allied Industries.

ACIDS

Butyric
Formic
Lactic, Edible and Technical
Molybdic
Oxalic
Stearic
Tannic
Phosphoric

DRIERS

Cobalt Acetate
Cobalt Linoleate
Cobalt Oxide
Cobalt Sulphate
Cobalt Nitrate
Lead Resinate, Fused and Precipitated
Lead Linoleate
Manganese Borate
Manganese Chloride
Manganese Oxide
Manganese Resinate, Fused and Precipitated
Manganese Sulphate

PYROTECHNICS

Antimony Sulphide, Needle
Barium Chlorate
Barium Nitrate
Bronze Powder
Iron Filings
Potassium Chlorate
Potassium Perchlorate
Potassium Nitrate
Phosphorus
Sodium Oxalate
Strontium Chlorate
Strontium Nitrate
Strontium Carbonate
Strontium Oxalate
Stearic Acid

TANNING MATERIALS

Blood Albumen
Birch-tar Oil
Lactic Acid, 22%, 44%, 80%
Antimony Lactate
Red Arsenic
Titanium-Potassium Oxalate
Woolgrease, Neutral
Degras

MISCELLANEOUS CHEMICALS

Ammonium Bifluoride
Ammonium Molybdate
Ammonium Oxalate
Amyl Butyrate
Antimony Sulphide, Needle
Antimony Sulphuret, Crimson and Golden
Cadmium Sulphide
Calcium Lactate
Calcium Bilactate
Cerium Oxalate
Fluorspar
Fusel Oil, Crude and Refined
Lanoline crude
Lanoline, U. S. P., Hydrous and Anhydrous
Lithopone
Magnesium Carbonate
Magnesium Chloride
Potassium Oxalate
Potassium Binoxalate
Rutile
Uranium Oxide
Zinc Chloride
Zinc Oxide

DRY COLORS AND PIGMENTS

Blacks
  Carbon Black
  Bone Black
  Drop Black
  Ivory Black
  Lampblack
  Vine Black
  Mineral Black
  Graphite Black
Reds
  Iron Oxide, Natural
  Iron Oxide, Artificial
  Venetian Red
  Red Ocher
  Indian Red
  Spanish Oxide
Yellows
  French Ocher
  Yellow Oxide
  Sienna, Raw
  Sienna, Burnt
Browns
  Turkey, Umber, Raw
  Turkey Umber, Burnt
  Sap Brown
  Van Dyke Brown
Whites
  Barytes
  Lithopone
  Zinc Oxide

INDUSTRIAL CHEMICAL COMPANY, INC.

HEAD OFFICE
Fifth Avenue Building, 200 Fifth Avenue
NEW YORK, N. Y.
LABORATORIES 36 West 37th Street

Cable Address
"KEMICO" New York

PRODUCTS

Acetone, Refined. C.P.
Acetone Oils. B.P. 80 -200 C.
Methyl-ethyl-ketone
Mixed Ketones
Denatured Alcohol. All formulas
Methyl Alcohol. All grades
Cymene. Terpene base oil
Tanning Extracts
  Hemlock Bark
  Larch Bark
  Chestnut Wood
  Osage Orange
Dyewood Extract. American Fustic
Carbons
  Decolorizing and Deodorizing
Powdered Charcoal
Whiting
Chalks
  Extra Light
  Light
  Heavy
Gas Carbon Black
Vegetable Carbon Black
Wood Flour

ACETONE OILS

Oils of great solvent power furnished with any desired range of boiling point from 80°C -200°C

CYMENE

A terpene base oil of great solvent power and strong, pleasant odor. Double-distilled product, Boiling-point 175°C

OSAGE ORANGE

An extract possessing both dyeing and tanning properties, produced in the form of powder or paste. Has largely superseded West India Fustic for dyeing cotton, wool and silk, and particularly valuable in leather tannage on account of its light color and high tanning content.

CHALKS

Domestic Products of a high degree of purity and a bulkiness second to none. We claim to be in a position to supply a lighter chalk than any other on the market. We manufacture three grades: **Extra Light, Light and Heavy.**

SUPER-FILTCHAR

Decolorizing and Deodorizing Carbon.

Experience has so fully justified all our previous claims for this product that we can now affirm that it has become a standard article in a variety of plants and processes.

We have found that the needs of a great majority of our customers have been covered by one of our three grades, and are therefore offering, as before, three qualities of **Super-Filtchar; Edible Oil, Pharmaceutical and Sugar.**

Edible Oil Quality

Our success in this field has been inspiring.

Nut Oils Cocoa nut and Palm Kernel.

Better results are obtained with small fractional percentages of Super-Filtchar than with 5% of fuller's earth

Seed and Bean Oils Cottonseed, Soya, Peanut.

Super-Filtchar is the ideal complement to fuller's earth. Results in

1. Better color
2. Removes earthy and objectionable flavors.
3. Reduced amount of fuller's earth giving:
   a—Lower absorption losses.
   b—Increased run of presses.
   c—Decreased labor cost.

Lard, Tallow and kindred products

Excellent results are being obtained with very small amounts of carbon.

Pharmaceutical Quality

Made especially for those industries held strictly accountable by law to produce an absolutely pure product. Used extensively in the manufacture of Glycerine, Tartaric Acid, Lactic Acid, Phosphoric Acid, Gelatine, Fruit Juices, Photographic and other high-grade chemicals where purity of product is paramount.

Sugar Quality

While the Pharmaceutical Quality has considerable value for decolorizing, clarifying and improving the flavor of various syrups, we can unreservedly recommend our Sugar Quality for the improvement of all saccharine liquors.

Cooperative Service

Our wide experience in decolorizing and deodorizing different products has taught us that the treatment of each substance should be considered as an individual problem. Our Technical Department will gladly advise as to the quality, quantity and method best suited for any particular purpose and is ready, at all times, to cooperate with prospective customers in whatsoever way they choose.

INTERNATIONAL COAL PRODUCTS CORPORATION

PLANTS
SOUTH CLINCHFIELD, VA
IRVINGTON, N. J.

511 Fifth Avenue, NEW YORK, N. Y.

Cable Address
"CARBOCOAL," New York.

CARBOCOAL

Trade-Mark

PRODUCTS

- Ammonia Liquor
- Crude Carbolic Acid
- Coal Tar Oils
- Coal Tar Pitch
- Creosotes
- Disinfectant Oils
- Flotation Oils
- "Incolac"
- "Incolene"
- "Incolite"
- "Incopitch"
- "Incosote"
- Naphthalene
- Tars
- Wood Preservatives

AMMONIA LIQUOR (Gas Liquor)
Free from tar Minimum cyanogen content.

ANTHRACENE OIL
Specific gravity 1 0988 to 1 100

CRUDE CARBOLIC ACID
Acid content from 5 to 40%

CREOSOTES
All grades, Standard specifications, Coal Tar Solutions, etc

CREOSOTE, SOLUBLE
An emulsified creosote

DEAD OIL (Heavy Oil)
Clear and limpid. For shingle stains, lampblack, etc

DIP OILS
For animal washes, sheep dips, etc

DISINFECTANT OIL
Phenol coefficient 2 to 6

FLOTATION OILS
Acid content 6 to 30%, also low temperature tar very suitable for flotation.

"INCOLAC"
A black, waterproof, acid-resisting, rust-proof paint, for wooden structures, fence posts, smokestacks, and all metal surfaces.

"INCOLENE"
High-grade motor fuel Product of low temperature distillation containing both paraffin and aromatic hydrocarbons, but no admixture of gasoline

"INCOLITE"
A thinner for "Incolac" and other coal-tar paints

"INCOPITCH"
A high-grade roofing pitch Furnished with any melting point

"INCOSOTE"
A tar-oil distillate. Specific gravity 0.98. Tar acid content 30%.

LIGHT OIL
Boiling point 110° to 180° C Including special low gravity oils Special cuts on request

MIDDLE OIL
A thin creosote Specific gravity 0 9675 to 1 010

NAPHTHALENE (Crude)
Melting point approximates 70° C

NEUTRAL OIL
A reddish brown, clear, limpid oil Suitable for making up disinfectants

PITCH
For roofing, briquetting, and waterproofing

ROAD OILS
For road construction, surface oiling, and dust-laying

SANITARY OIL
A creosote oil for workers, factory lavatories, etc

TARS
Coke oven, dehydrated, refined Solutions Special low gravity tars

TAR ACID OIL

HEAVY NAPHTHA
160° 210° For paints and degreasing purposes

SHIPMENTS
We have our own tank cars (8000 and 10000 gal.) and also ship in iron drums

CARBOCOAL
A smokeless fuel, manufactured from bituminous coal Equal to best grades of prepared anthracite

Carbocoal is dense, dustless, clean, uniform in size and quality, and can be readily handled and transported long distances without disintegration It is grayish in color, slightly resembling coke, but its density more nearly approaches that of anthracite coal It is manufactured in briquet form

Heretofore, devolatilized fuels, such as coke, have not attained the high rates of combustion desired for locomotive, marine and general steam purposes, and their greater displacement has operated against their general use where transportation cost or stowage space has been an important factor Carbocoal is a relatively soft but tough form of carbon readily attacked by oxygen in combustion; and for this reason, requires much less draft than other high-carbon fuel.

CARBOCOAL PLANTS
Engineers, Constructors, and Operators
Estimates and financial plans on application.

THE INTERNATIONAL NICKEL COMPANY

Nickel, Monel Metal, Nickel Salts

GENERAL OFFICES
MUNSON BLDG., 67 WALL ST., NEW YORK, N. Y.
MINES AND SMELTERS
Sudbury Ont Canada
REFINERIES
Bayonne New Jersey and Port Colborne Ont Canada

PRODUCTS

Nickel Salts

- Nickel Acetate
- Nickel-Ammonium Sulphate
- Nickel Carbonate (Basic)
- Nickel Chloride
- Nickel Chromate (Basic)
- Nickel Formate
- Nickelic Hydroxide
- Nickelous Hydroxide
- Nickel Oxide (Black)
- Nickel Oxide (Green)
- Nickel (Reduced Oxide)
- Nickel Sulphate
- Nickel Sulphide (Fused)
- Nickel Sulphide (Pptd.)

Nickel

- Shot
- Blocks
- Ingots
- Electrolytic nickel—99.80%
- Rods
- Castings
- Flats
- Strip
- Sheet
- Wire
- Tube
- Wire cloth

Monel Metal

- Shot
- Ingots
- Blocks
- Sheet
- Tube
- Flats
- Rods
- Strip
- Castings
- Wire
- Wire cloth

NICKEL

Long before the isolation and recognition of the element nickel, alloys of a copper-nickel composition were known and used. Representative of such alloys are Bactrian coins of the Third Century B. C.

In 1694 Hierne discovered the mineral known as Niccolite, but not until 1751, however, was the metal isolated by Cronstadt, who recognized it as a new element and metal, and in 1754 named it "Nickel."

Since that time the chemistry of this metal has been continuously unfolded until today a large variety of its alloys and compounds are known.

Malleable Nickel—In 1804, Richter showed that the metal was malleable, ductile and possessed a high tensile strength. Fleitman, in 1879, made an even more malleable nickel by the addition of magnesium.

Electroplating—was produced in 1843 by Boettger.

Nickel Steel In the New York Exposition in 1853, nickel iron alloys were exhibited. After this, Marbeau, in France, made experiments with crucible steel alloys, and in 1888 James Riley began experimenting with nickel steel in Scotland. The results were published in 1889. These demonstrated the properties of nickel steels and pointed out their commercial value. This group today is the most widely used of all alloy steels.

Hydrogenation of Oils—In 1896 Sabatier and Senderens showed that nickel has the remarkable property of causing, by its catalytic action, the reduction of unsaturated hydrocarbons and other organic compounds to saturated ones by means of molecular hydrogen. There was thus initiated the process of producing edible, saturated oils and fats from cheaper unsaturated ones.

The Edison Accumulator—Thomas A. Edison, in 1902, developed and patented the "nickel" storage cell largely used in place of the lead accumulator in electric motors and vehicles.

Monel Metal—In 1905 The International Nickel Company first produced this natural alloy by the direct reduction of their ores, without effecting any separation of the copper nickel contents.

This metal possesses physical and chemical properties very similar to those of metallic nickel, which have led to its extended use by the modern manufacturer, especially where strength combined with chemical corrosion or steam erosion resistance is a requisite.

GENERAL CHARACTERISTICS OF NICKEL

Nickel is a white, malleable, and somewhat magnetic metal, harder and stronger than iron and of high melting point. It is remarkably resistant to the action of air and water, of non-oxidizing acids, fused alkalies and of salts, either fused or in aqueous solution.

Valency—As well known, Nickel is primarily divalent, it forms some compounds relatively unstable, in which it functions as tri-valent; and there exists also a peroxide (NiO_2).

Nickel belongs to that odd group of metals—nickel, cobalt and iron, which in the Periodic System of the elements hovers uncertainly between the acid-forming and the base-forming elements, and which is related quite closely to the noble platinum metals.

Catalytic Activity—Nickel and its compounds possess a unique catalytic activity both in variety and intensity; they may function apparently in reduction, oxidation and addition reactions. Thus finely divided nickel is used in the **hydrogenation of oils,** nickel oxide will catalyze the oxidation of gaseous sulphur dioxide in the **contact process,** nickel chloride, similarly, the production of chlorine in the **Deacon process.** Nickel chloride will also perform the function of catalyzer in the famous **Friedel and Craft** syntheses.

Passivity—Nickel exhibits markedly the phenomenon of passivity, i. e., of becoming inert to the action of highly oxidizing acids, such as nitric or chromic, when exposed to their action. We may ascribe to this interesting property some measure, at least, of its ability to withstand corrosion.

Color—Nickel is a powerful decolorizing agent for metals such as copper and gold. Several jewelers' white alloys are produced today as substitutes for platinum under the name of white gold. They contain from 20 to 50% of nickel with the remainder gold. Even in small amounts nickel decolorizes copper and its alpha alloys.

The chemical compounds of nickel exhibit its greatest variety of color, varying from the green of its com-

Continued on Next Page

mon salts to the red of the dimethylglyoximate. Recent developments indicate that nickel salts associated with oxides of zinc, barium, calcium or potassium in the preparation of ceramic glazes, are capable of producing a wide range of colors.

Perhaps one of the oldest commercial uses of nickel salts is as a mordant in the dyeing industry.

MONEL METAL

The name Monel metal identifies the natural nickel alloy—67% nickel, 28% copper and 5% other metals—produced by the International Nickel Company. Monel metal withstands alkalis, hot gases, most acids, saline solutions, and extremes of temperature. It is very resistant to corrosion and abrasion.

It is tough, ductile and has the strength of mild steel.

It can be machined, cast, forged, rolled, drawn, brazed, soldered, welded, annealed and spun.

TABLE OF PHYSICAL PROPERTIES OF MONEL METAL

Melting Point ...	1 360°C (2 480°F)
Specific Gravity (Cast)	8 87
Weight Per Cu In (Cast)	0 319 lb
Weight Per Cu In (Rolled)	0 321 lb
Coefficient of expansion (20°C - 100°C)	0 00000765 per 1°F
Electrical Resistivity, 256 Ohms per mil foot	
(Temp Coefficient) .	0 0011 per 1°F
Electrical Conductivity	4% (Copper 100%)
Heat Conductivity ...	1 15 that of Copper
Shrinkage	¼" per foot
Hardness Cast Material	20 30 (Shore Scleroscope)
Hardness Hot Rolled Rods	27 (Average Shore Scleroscope)
Hardness, Hot Rolled Rods	162 (Average Brinnell)
Modulus of Elasticity	22 000 000 25,000 000
Tortional Tests on Rods (Average)	
Shearing Stress—Lbs per sq in on remotest fibers	
At Elastic Limit	31,796
At Ultimate Load	79 053
Compression Tests on Rods	
Proportional Limit	28 000 to 50,000 lbs per sq in
Yield Point .	63 000 to 70 000 lbs per sq in
Compression Tests on Castings	
Proportional Limit	15,000 to 20 000 lbs per sq in
Yield Point ...	30 000 to 32,000 lbs per sq in
Compression Tests on Castings (Average)	
Yield Point.......	37 093 lbs per sq in
Tensile Strength ..	72 281 lbs per sq in
Elongation in 2 ins .	11%
Reduction of Area	32%
Tensile Tests on Rods	
Yield Point.. .	55,000 lbs per sq in
Tensile Strength	88,300 lbs per sq in
Elongation in 2 ins .	.42%

TABLE OF THEORETICAL WEIGHTS MONEL METAL SHEETS

THICKNESS			WEIGHT		THICKNESS			WEIGHT	
U S Legal Standard	Approximate Thickness in Fractions of an Inch	Approximate Thickness in Decimal Parts of an Inch	Weight per Square Foot in Ounces Avoirdupois	Weight per Square Foot in Pounds Avoirdupois	U S Legal Standard	Approximate Thickness in Fractions of an Inch	Approximate Thickness in Decimal Parts of an Inch	Weight per Square Foot in Ounces Avoirdupois	Weight per Square Foot in Pounds Avoirdupois
2	17-64	265625	194½	12 211	16	1 16	0625	45¾	2 873
3	1-4	25	183	11 493	17	9 160	5625	41	2 586
4	15-64	234375	171¾	10 774	18	1 20	05	36½	2 30
5	7 32	21875	160¼	10 056	19	7 160	04375	32	2 011
6	13 64	203125	148¾	9 338	20	3 80	0375	27½	1 724
7	3 16	1875	137½	8 619	21	11 320	034375	25	1 580
8	11 64	171875	126	7 901	22	1 32	03125	22¾	1 437
9	5-32	15625	114½	7 183	23	9 320	028125	20½	1 293
10	9 64	140625	103	6 465	24	1 40	025	18¼	1 149
11	1-8	125	91½	5 746	25	7-320	021875	16	1 005
12	7-64	109375	80¼	5 028	26	3 160	01875	13¾	862
13	3 32	09375	68¾	4 310	27	11 640	0171875	12½	7901
14	5 64	078125	57¼	3 591	28	1 64	015625	11¼	7183
15	9-128	0703125	51½	3 232					

MONEL'S PROBABLE RESISTANCE TO CORROSION

On account of the varying conditions occurring in chemical work, it is difficult to recommend Monel unqualifiedly in connection with any particular substance. The following list is intended to show where Monel can be recommended and where Monel is not recommended.

Y - Monel is recommended
N Monel is not recommended
T Reports contradictory, trial should be made

Aluminum Sulphate	Y
Ammonia	Y
Benzoic Acid	Y
Butyric Acid	Y
Calcium Chloride	Y
Calcium Sulphate	Y
Carbolic Acid	Y
Chromic Acid	N
Citric Acid	Y
Copper Sulphate	N
Ferric Sulphate	N
Formic Acid	Y
Hydrochloric Acid	Y T
Hydrocyanic Acid	Y
Hydrofluoric Acid	Y
Lactic Acid	Y
Lime	Y
Malic Acid	Y
Mercuric Chloride	N
Muriatic Acid	Y T
Nitric Acid	N
Oleic Acid	Y
Palmitic Acid	Y
Perchloric Acid	N
Phosphoric Acid (cold weak)	Y
Phosphoric Acid (hot)	N
Picric Acid (cold)	Y
Picric Acid (hot)	N
Potassium Hydroxide	Y
Sodium Hydroxide	Y
Sodium Hyposulphite	Y
Sodium Sulphate	Y
Stearic Acid	Y
Sulphuric Acid	Y T
Sulphurous Acid	N
Tannic Acid	Y
Tartaric Acid	Y
Water Fresh	Y
Water Salt	Y
Zinc Salts	N T
Atmospheric corrosion	Y
Molten Metals	N
Gases of combustion	Y T
Molten sulphur	N
Metallic Mercury	Y
Steam superheated	Y
Steam wet	Y

SOME USES FOR WHICH MONEL METAL HAS PROVED TO POSSESS PECULIAR MERITS

Filter cloth, screens, centrifugal liners, pump and valve parts, agitators and shafts, tie rods, nuts, washers and lag screws in chemical plants, tanneries, dyehouses, bleacheries, etc. Trays for shelf dryers, crystallizing pans, tubing for evaporators, concentrators and stills, linings for chemical equipment.

Mine screens, coal chutes, mining machinery and equipment, pump liners and rods, parts of centrifugal pumps, valves and fittings in the coal industry.

Pump parts, fourdrinier screen, cylinder covers, rolls, valves and castings in pulp and paper mills.

Ink handling machines—bottle fillers, etc.

Refrigerating machine parts, valves and trim and pump parts for handling brine, etc.

Parts of special glass factory equipment coming in contact with hot glass.

Homogenizers, tanks, freezer parts, evaporators, for all dairy products except cheese.

It is used in power plants in all industries for turbine blading, valve parts and all places which come in contact with superheated steam.

Cooking equipment in hotels, factory restaurants, etc., and also in packing houses and plants manufacturing food products where materials come in contact with food acids, fruit juices, brine, etc.

TECHNICAL RESEARCH

The International Nickel Company maintains a large technical staff and laboratory for the purpose of testing its products under various conditions, and will be glad to investigate and give advice to anyone who wishes to submit any question on Monel metal or nickel.

LITERATURE

Instruction sheets on the various methods of working Monel can be had on application.

JARDINE, MATHESON & CO., LTD.

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Ichang
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Chinkiang
Kiukiang

Yokohama
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Nagasaki
Shimonoseki

PRODUCTS

Importers of

- **Albumen**
  - Dried Egg
- **Beans, Peas and Seeds**
- **Braids**
  - Straw and Hemp
- **Bristles**
- **Camphor**
- **Cotton, Raw**
- **Deerskins, Untanned**
- **Eggs and Egg Products**
- **Feathers**
  - Duck
  - Goose
  - Fowl
- **Fibers**
  - China Grass (Ramie)
  - Hemp
  - Jute
- **Fur Skins**
  - Raw
  - Dressed
- **Gallnuts**
- **Goatskins and Sheepskins, Untanned**
- **Hair**
  - Goat
  - Horse
  - Human
- **Hides and Skins, Untanned**
- **Minerals**
  - Antimony
  - Tungsten Ore
- **Musk**
- **Oils, Essential**
  - Anise
  - Cassia
- **Oils, Textile**
  - Tea-seed
- **Oils, Vegetable**
  - Castor
  - China Wood
  - Cotton-seed
  - Peanut
  - Rape-seed
  - Sesame
  - Soya-bean
- **Peanuts**
- **Silk, Raw**
- **Spices, Cassia**
- **Tea**
- **Tallow**
  - Animal
  - Vegetable
- **Tobacco**
- **Wool, Raw**
  - Camel
  - Cashmere
  - Lamb
  - Sheep
- **Yolk, Egg**
  - Dry

Exporters of

- Railway Equipment
- Electrical Supplies
- Iron and Steel Products
- Metals
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Manufacturers, Importers and Distributors of Coal-Tar Products

Code ABC, 5th Edition

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JORDAN COAL TAR PRODUCTS CO, INC.
WORKS Matawan, N J and Brooklyn, N Y

INTERNATIONAL COAL PRODUCTS CORPORATION
WORKS Clinchfield Va & Irvington, N J

PRODUCTS

- Cresylic Acid
- Cresol
- Cresol, U. S. P.
- Cresol, Para-, 31°-33° C.
- Cresol, Meta-, 98-100%
- Cresol, Ortho
- Dip Oils
- Crude Carbolic Acid
- Creosote Oils
- Flotation Oils
- Naphthalene, Refined
- Pyridine
- Sheep Dip
- Shingle Oils
- Solvent Naphtha
- Toluol
- Benzol
- Soluble Creosote
- Black Paints
- Pitch

	Specifications and General Information	Packages usually sold in, with approximate weight and cubic measure				
		Container	Contents	Gross lb	Net lb	Cu ft.
Benzol, Pure	Water white, distilling between 79° and 81° C	Drums	100 gal	950	720	24
Benzol, 90%	Water white, distilling 90% at 100° C	Drums	100 gal	950	720	24
Toluol, Pure	Water white, distilling between 109° and 111° C	Drums	100 gal	950	720	24
Toluol, 90%	Water white, distilling at least 90% at 120° C	Drums	100 gal	950	720	24
Xylol, Pure	Water white, distilling between 135 and 145° C	Drums	100 gal	950	720	24
Xylol, Commercial	Water white, distilling 90% at 150° C	Drums	100 gal	950	720	24
Solvent Naphtha, 90%	Water white, distilling 90% at 160° C	Drums	100 gal	950	720	24
Solvent Naphtha, Crude	Straw color, distilling 80% at 160° C	Drums	100 gal	925	700	24
Heavy Naphtha	Amber color, distilling 70% at 200° C	Drums	100 gal	1050	825	24
Dead Oil	Specific gravity, 0.980 to 1.000	Drums	100 gal	1050	825	24
		Barrels		475	400	12
Dip Oil **Creosote Oil**	Specific gravity, 1.000 to 1.030	Drums	100 gal	1050	825	24
		Barrels		475	400	12
Flotation Oils	Specially prepared for Ore Flotation	Drums or	100 gal	1050	825	24
		Tank-cars	about 8000 gal			
Shingle Oil	Specific gravity, 0.930 to 0.990	Drums	100 gal	1050	825	24
		Barrels		475	400	12
Crude Carbolic Acid Tar Acid content 5 to 95 per cent.	Spec grav according to Tar Acid content	Drums	100 gal	1050	825	24
		Barrels		475	400	12
Creosote Soluble Making white emulsion with carbolic, coefficiency 1 to 10 R W test	Sold under various private names or brands	Drums	100 gal	1050	825	24
		Barrels		475	400	12
Sanitary Fluid or Sheep Dip Same as Soluble Creosote	Sold under various private names or brands	Drums	100 gal	1050	825	24
		Barrels		475	400	12
Carbolic Acid Crystal, U. S. P.	White crystal, melting-point 39° to 41° C	Drums	240 lb	251	240	......
		Drums	475 lb	580	475	12
Phenol, U. S. P.	White crystal, melting-point 39 to 41° C	Drums packed for export	240 lb	300	240	12
Pyridine	90% at 160° C for denaturing	Drums	100 gal	1050	816	24
Anthracene	20%-40%-80%	Bags 20 to 25%	about 300 lb	.	..	......
		Casks 40%	....	650	600	.....
Naphthalene, Crude and Refined Flakes, Balls, Crystals	Crude in bags Refined in barrels	Crude, bags	about 200 lb	203	200	6
		Flake, barrels	175 lb	200	175	12
		Crystals, bbls	250 lb	275	250	12
High Boiling Acids	British War Office Spec	Drums	100 gal	1075	850	24
High Coefficiency Fluid Carbolic coefficiency 18 to 20 R-W test	18 to 20 coefficiency, Rideal-Walker Method.	Barrels	50 gal	506	425	12
Cresylic Acid, 95 to 100%	Pale color at time shipment, also dark color.	Drums	100 gal	1050	850	24
		Barrels	50 gal	500	425	12
Cresol, U. S. P.	Distilling 90% between 195° and 205° C.	Drums	100 gal	1050	850	24
		Drums	50 gal	500	425	12
Cresol, Ortho-	Crystals, melting-point 28° to 29° C.	Drums packed in over cask	....	385	336	11
Cresol, Meta-, 98 to 100%	Cans about 52 lb net	Small drums	....	62	52	2½
Cresol, Para-, 31° to 33° C.	Drums about 336 lb net or cans 112 lb	Drums packed in over cask	....	385	336	11
Jordanite, Black Paint, for iron or woodwork	Drums 50 or 100 gal, or barrels 50 gal	....	....	....	.....	.....
Tar, Refined, etc	Barrels 50 gal. or drums 100 gal	Barrels	about 50 gal	550	475	11
		Drums	100 gal.	1125	900	24
Pitch, Roofing, etc,	Barrels about 500 lb	Barrels	300 or 550 lb	.....	.....	.....
Black Steel Coating	Barrels about 50 gal or drums 100 gal	Barrels	50 gal	525	450	11
		Drums	100 gal	1125	900	24
Black Varnish	Barrels about 50 gal., or drums about 100 gal.	Barrels	50 gal	525	450	11
		Drums	100 gal	1125	900	24
Disinfecting Powder Absorbent base and Cresylic Acid for general disinfecting	Barrels about 350 lb	Barrels	....	375	350	11

THE KALBFLEISCH CORPORATION

Manufacturers of Acids and Chemicals
Thirty-one Union Square West
NEW YORK, N. Y.

Cable Address
"OQUEDAL" New York
Code
Western Union, Universal Edition

WORKS
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PRODUCTS

Acids, Chemicals and Salts.

ACIDS

Dipping—A mixture of sulphuric and nitric acids with a small quantity of muriatic, for brass and metal dipping or finishing. Made to special formula if desired. In carboys containing approximately 150 lb. net.

Etching—Nitric acid of a strength usually specified by user. In carboys containing 140 lb. net.

Hydrochloric (Muriatic)—Used by sugar mills, galvanizers, chemical manufacturers, bleachers, silk dyers, chlorine makers. Furnished in 18°, 20°, 22° Bé., commercial and C. P. grades. In carboys containing 120 lb. net.

Nitric—Used for chemical manufacturing, brass and metal finishing, dyeing, etching copper plates and printers' rolls. Furnished in 36° to 43° Bé. incl., and C. P. grades. In carboys containing 140 lb. net.

Sulphuric—Used for pickling iron and steel, in dye works, various chemical manufacturing processes, bleaching textiles, tanning. Furnished in 50°, 60° and 66° Bé., also C. P. grades. In carboys containing 180 lb. net, also 55 and 110 gal. drums containing 750 and 1500 lb. net, respectively.

Electrolyte—For lead storage batteries. Made from pure sulphuric acid, any strength 1.150 to 1.820 specific gravity. In carboys containing from 115 to 185 lb. net.

Oil of Vitriol—66° Bé Sulphuric acid.
Aqua Fortis (Nitric).
Mixed (Nitro-sulphuric).
Muriatic (Hydrochloric).
Soldering (Hydrochloric).

SULPHATE OF ALUMINA

Filter Alum—For clarifying and purifying water for chemical and paper manufacturers, and refrigeration plants. Furnished in ground or lump form in two strengths 17% (ordinary) and 22% (extra concentrated). In barrels containing 400 lb. net or bags containing 200 lb. net.

Paper Makers Alum—Commercial sulphate of alumina, about ½ of 1% basic. For sizing and finishing cardboard, manila and wrapping papers, also book and music paper, and tanning leather. Furnished either lump or ground. In barrels containing 400 lb. net or bags containing 200 lb. net.

Sulphate, pure—Technically free from iron, actually contains only a mere trace of iron. Used in the manufacture of lake colors for printing inks, for tinted bond papers and sizing high grade bond and ledger papers, and for tanning white and kid leathers. Either lump or ground. In barrels containing 400 lb. net or bags containing 200 lb. net.

SALTS

Artificial Salts—Crystals or Powdered. For medicinal purposes. In barrels containing 375 lb. net.

Glauber's Salt—Crystallized sulphate of soda. Contains about 50% water of crystallization, but is preferred by many to the anhydrous salt on account of its easy solubility in water of ordinary temperature. Free from iron and absolutely neutral. For the textile and dyeing industries. In barrels containing 330 lb. net, also in kegs if desired.

Salt Cake—Sulphate of soda commercial, calcined, crude or ground. Used in the manufacture of glass, also in producing sulphate pulp for kraft paper. Standard 96% with about 1% free acid and about 1% salt. In barrels containing 400 lb. net.

Sodium Sulphate, Extra—A very pure sulphate called, in some cases, Calcined Glauber's Salt. Free from ammonia and iron, and strictly neutral. Used for standardizing aniline colors, etc. Contains no water of crystallization. In barrels containing 400 lb. net.

Sodium Bisulphate (Niter-cake)
Sodium Bisulphite (For bleaching)
Calcined Sodium Sulphate
Cathartic Salts

MISCELLANEOUS

Aqua Ammonia—All strengths up to 26° Bé.
Banana Liquid
Bronzing Liquid
Casein
China Clay (English)
Chloride of Zinc

Chromitron—For polishing and sharpening razor blades, etc. An extremely fine, fast cutting material. Much superior to rouge, emery and like articles. In special package.

Crystal Boro Phosphate—Solvent for casein.
Distilled Water
Lacquers and Thinners
Nitrate of Mercury—For cutting fur.
Perchloride of Iron—For etching.
Rosin Size
Satin White
Shellac Solvent
Soldering Fluid

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This company is headquarters for all kinds of Chemicals, Colors, Dyestuffs, Glycerines, Gums, Oils, Tanning Materials, Raw Materials, and other products used in the various industries, and solicits your inquiries for prices whenever you are in the market either for prompt delivery from here or shipment from abroad. All inquiries will have prompt and careful attention.

ACIDS

Acetic
Benzoic
Carbolic (Crystals)
Citric
Formic
Lactic
Oxalic
Sulphuric
Stearic
Tannic
Tartaric
Chromic
Muriatic (Hydrochloric)

OILS

Aniline
Creosote
China Wood
Soya Bean
Olive
Myrbane
Birch
Castor
Fusel
Turkey Red
Sulphonated
Corn

SODAS

Bichromate
Carbonate
Caustic
Chlorate
Nitrate
Nitrite
Sulphate
Sulphite
Acetate
Phosphate
Arseniate
Benzoate
Bisulphide
Cyanide
Permanganate
Peroxide
Prussiates
- Red
- Yellow

Stannate

TANNING MATERIALS

Ricinola Oil
Pescola
Mazola Oil
Soluble Castor Oil
Chrome Sulphate Liquor
Mangrove Bark
Divi Divi
Quebracho Extract
Chestnut Extracts
Logwood Extracts
Liberty Extract
Hemlock Extract
Myrobalans
Lactic Acid
Medol

POTASHES

Bicarbonate
Bichromate
Bisulphite
Chlorate
Chloride
Cyanide
Muriate
Nitrate (Saltpeter)
Permanganate
Prussiates
- Red
- Yellow

Sulphate
Sulphide

DYES

Acid Dyes (for Wool and Silk)
Basic Dyes (for Lakes, Leather and Paper)
Chrome Dyes (for Wool)
Direct Dyes (for Cotton)
Pyrogen Dyes (for Cotton)
Sulphur Dyes (for Cotton)
Oil, Spirit or Water Soluble Colors (for Paints, Varnishes, etc.)

GUMS

Congo
Damar
Kauri
Zanzibar
Arabic
Manila
Pontinac
Tragacanth
Copal
Karaya
Synthetic
Alcho-ester
Glycro-ester
Zinco-ester

MISCELLANEOUS

Chrome Acetate
Chrome Chloride
Chrome Sulphate
Carbon Tetrachloride
Chlorobenzol
Benzol
Barium Acetate
Barium Carbonate
Barium Chloride
Barium Chlorate
Bleach
Solvent Naphtha
Naphthalene
Blue Vitriol
Copper Sulphate
Barium Sulphide
Barium Hydrate
Barium Nitrate
Barium Peroxide
Barium Sulphate
Sulphate of Alumina
Resinates (fused and precipitated)
Oleates (fused and precipitated)
Linoleates (fused and precipitated)

This company is also Sole Distributor for the products made by the

Bulls Ferry Chemical Company
Edgewater, N. J.

E. C. Klipstein & Sons Company
Chrome, N. J., and South Charleston, W. Va.

GUARANTEED CHEMICALS

TRADE MARK

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PRODUCTS

Crystallized Indicator Dyes
Standardized Indicator Solutions
Standardized Synthetic Chemicals
Analytical Outfits
Standard Buffer Solutions
Color Standards
Special Reagents

CRYSTALLIZED INDICATOR DYES

Our standardized indicators cover a wide range of H-ion concentration, each indicator having been standardized to conform to the specifications of W. A. Clark and H. A. Lubs.

These indicators are supplied in 1, 5, and 25 gram glass-stoppered bottles.

Benzopurpurine B

Bromocresol Purple

Recommended as a substitute for litmus, covering its entire range, and exhibiting sharper and more brilliant color changes. Range p_H 5.2 to 6.8. Color: Yellow-purple.

Bromophenol Blue

Range: p_H 3.0 to 4.6. Color: Yellow-blue.

Bromothymol Blue

Recommended as a substitute for litmus in practically all tests and titrations. Exhibits sharper and more brilliant color changes. Range: p_H 6.0 to 7.6. Color: Yellow-blue.

Cresolphthalein

Cresol Red

Crystal Violet

Fuchsine

Indigotine

Litmus

Methyl Orange

Methyl Red

Range: p_H 4.4 to 6.0. Color: Red-yellow.

Methyl Violet

Methylene Blue

Zinc salt, also zinc-free

Phenolphthalein

Phenol Red

Range: p_H 6.8 to 8.4. Color: Yellow-red.

Resorcinol Blue (Lacmoid)

Thymol Blue-Acid

Range: p_H 1.2 to 2.8. Color: Red-yellow.

Thymol Blue-Alkaline

Range p_H 8.0 to 9.6. Color: Yellow-blue.

This dye serves as the combination of the two indicators, Congo Red and Phenolphthalein, since it shows sharp and brilliant color changes over the two widely separated working ranges. It is especially recommended for differential titrations as well as for general routine analysis.

Trinitrobenzene

Tropæoline OO

STANDARDIZED INDICATOR SOLUTIONS

We are prepared to furnish all of our standardized indicators in solution (alcoholic and aqueous) in 100 cc. glass-stoppered bottles, which are specially sealed to prevent evaporation, entrance of dust, and deterioration. Strengths 1 and 5 per cent. Special strengths prepared on request.

STANDARDIZED SYNTHETIC CHEMICALS

These materials represent the highest quality obtainable, our methods for standardizing them include a careful analysis of the finished product and practical testing in some of its more common uses. These are supplied in 100, 250, and 500-gram glass-stoppered bottles.

Acetone, 100%

For determining the dielectric constants of pure compounds.

Aniline, 100%

Nearly colorless, free from benzene and nitrobenzene. Boiling-point 183° to 184° C.; freezing-point − 5° C.

Aniline Hydrochloride

White crystals, free from aniline. Melting-point 198° C.

Aniline Sulfate

White crystals, free from aniline and acid.

Anthranilic Acid

White crystals. Melting-point 145° C.

Ammonium Sulfate

White crystals. Melting-point 140° C.

Butyl Alcohol, Normal

In two grades: Special standard, and pure. Boiling-points 117° C.-118° C. and 116°-119° C. respectively.

Cupferron

Creamy-white crystals. Special standard.

Continued on Next Page

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283-285 Congress Street

Charlotte, N. C.
Commercial National Bank Bldg.

Chicago, Ill.
145-147 W. Kinzie Street

Philadelphia, Pa.
50-52 N. Front Street

Providence, R. I.
140 Fountain Street

Represented in Canada by
A. KLIPSTEIN & COMPANY, LIMITED
12 St. Peter Street, MONTREAL

PRODUCTS

Chemicals, Dyestuffs, Dyewood Extracts, Tanning Extracts, Coal-tar Dyes, Colors, Textile Chemicals, Pharmaceutical Chemicals, Gums, Oils and Raw Materials for all Industries.

This company is headquarters for all kinds of Chemicals, Colors, Dyestuffs, Glycerines, Gums, Oils, Tanning Materials, Raw Materials, and other products used in the various industries, and solicits your inquiries for prices whenever you are in the market either for prompt delivery from here or shipment from abroad. All inquiries will have prompt and careful attention.

ACIDS

Acetic
Benzoic
Carbolic (Crystals)
Citric
Formic
Lactic
Oxalic
Sulphuric
Stearic
Tannic
Tartaric
Chromic
Muriatic (Hydrochloric)

OILS

Aniline
Creosote
China Wood
Soya Bean
Olive
Myrbane
Birch
Castor
Fusel
Turkey Red
Sulphonated
Corn

SODAS

Bichromate
Carbonate
Caustic
Chlorate
Nitrate
Nitrite
Sulphate
Sulphite
Acetate
Phosphate
Arseniate
Benzoate
Bisulphide
Cyanide
Permanganate
Peroxide
Prussiates
  Red
  Yellow
Stannate

TANNING MATERIALS

Ricinola Oil
Pescola
Mazola Oil
Soluble Castor Oil
Chrome Sulphate Liquor
Mangrove Bark
Divi Divi
Quebracho Extract
Chestnut Extracts
Logwood Extracts
Liberty Extract
Hemlock Extract
Myrobalans
Lactic Acid
Medol

POTASHES

Bicarbonate
Bichromate
Bisulphite
Chlorate
Chloride
Cyanide
Muriate
Nitrate (Saltpeter)
Permanganate
Prussiates
  Red
  Yellow
Sulphate
Sulphide

DYES

Acid Dyes (for Wool and Silk)
Basic Dyes (for Lakes, Leather and Paper)
Chrome Dyes (for Wool)
Direct Dyes (for Cotton)
Pyrogen Dyes (for Cotton)
Sulphur Dyes (for Cotton)
Oil, Spirit or Water Soluble Colors (for Paints, Varnishes, etc.)

GUMS

Congo
Damar
Kauri
Zanzibar
Arabic
Manila
Pontinac
Tragacanth
Copal
Karaya
Synthetic
Alcho-ester
Glycro-ester
Zinco-ester

MISCELLANEOUS

Chrome Acetate
Chrome Chloride
Chrome Sulphate
Carbon Tetrachloride
Chlorobenzol
Benzol
Barium Acetate
Barium Carbonate
Barium Chloride
Barium Chlorate
Bleach
Solvent Naphtha
Naphthalene
Blue Vitriol
Copper Sulphate
Barium Sulphide
Barium Hydrate
Barium Nitrate
Barium Peroxide
Barium Sulphate
Sulphate of Alumina
Resinates (fused and precipitated)
Oleates (fused and precipitated)
Linoleates (fused and precipitated)

This company is also Sole Distributor for the products made by the

Bulls Ferry Chemical Company
Edgewater, N. J.

E. C. Klipstein & Sons Company
Chrome, N. J., and South Charleston, W. Va.

JOHN S. LAMSON & BROTHER, INC.

100 JOHN STREET, NEW YORK, N. Y.

Cable Address
"SARPLAR," New York
Codes
ABC, 4th & 5th Editions
Bentley's
Western Union, 5 Letter Edition

BRANCH OFFICES

Independent Oil & Supply Co
140 West Van Buren St
Chicago, Ill

295 King St., West
Toronto Canada

WAREHOUSES
New York, N. Y.
Toronto Can
Chicago, Ill

PRODUCTS

Manganese Compounds; Asphalts; Pitches; Waxes; Manganese, Cobalt and Lead Driers; and Chemicals.

FOR PAINT, VARNISH, ENAMEL AND JAPAN MANUFACTURERS

Natural Asphalts

Gilsonite, Manjak, Grahamite, Varnish-makers Black, Egyptian, South American, Barbados, West Indian and Trinidad Asphalts.

Refined, Blown and Petroleum Asphalts

From California, Mexico, Trinidad and Mid-Continent fields.

Manganese Driers

Borate, Resinate, Oxide, Sulfate, Chloride, Recovered, Hydrated, Linoleate.

Cobalt Driers

Acetate, Hydrate, Linoleate, Oxide, Resinate, Sulfate, Carbonate, Chloride.

Lead Driers

Resinate, Linoleate, Stearate.

Pitches

Stearine, Cotton-seed, Palm Oil, Bone, Candle, Burgundy, Swedish, Refined.

Pigments

Carbon gas-black, Imported Lithopone, Powdered Asphalt, Turkey Umber, Siennas.

FOR FLASHLIGHT, DRY AND STORAGE BATTERY MANUFACTURERS

Manganese oxide (all grindings), Zinc chloride, Sal Ammoniac, Sealing-waxes and Asphalt compounds, Acid-resisting paints.

FOR RUBBER GOODS MANUFACTURERS

Mineral Rubber (all melting-points), Blown Asphalt, Carbon gas-black, Red Rosin, Burgundy Pitch, Lithopone, Liquid Rubber, Dry Colors, Barytes.

FOR GLASS AND PORCELAIN MANUFACTURERS

Manganese dioxide (all grindings), Precipitated or Recovered Manganese, Cobalt sulfate, Acid and Alkali Resisting Paints.

FOR ELECTRIC CONDUIT, WIRE AND CABLE MANUFACTURERS

Stearine, Cotton-seed and Palm Oil Pitch. Mica Flour, Mineral Rubber; Montan, Ceresin, and Bee's-waxes. Weatherproof, Flame Proof, Saturating and Finishing Compounds.

FOR PRINTING INK MANUFACTURERS

Stearine, Cotton-seed and Candle Pitches. Powdered Asphalt, Carbon gas-black, Manganese, Cobalt and Lead Driers. Ink-maker's Long-M Pitch

FOR METAL WORKING MANUFACTURERS

Sal Ammoniac, gray, granular, galvanizing, lump and imported grades. Zinc chloride. Acid and Alkali resisting paints.

FOR CARBON PAPER MANUFACTURERS

Montan Wax, crude and bleached. Carnauba Wax, crude and refined. Carbon gas-black.

FOR SHOE POLISH MANUFACTURERS

Montan, Bee's and Ceresin Waxes, Carbon gas-black.

FOR BELTING, BRAKE LINING, CLUTCH FACING MANUFACTURERS

Gilsonite, Asphalt and Wax saturating compounds.

FOR ELECTRICAL MANUFACTURERS

Sealing waxes and compounds, Insulating paints and varnishes, Impregnating and coil filling compounds.

FOR ROOFING AND WATERPROOFING MANUFACTURERS

Natural, refined, blown and compound Asphalts. Cotton-seed, Candle, and Stearine Pitches, Montan, Insulating and Saturating waxes.

Established 1866

JOHN D. LEWIS

Manufacturers, Importers and Exporters

Turk's Head Building
PROVIDENCE, R. I.

Boston, Mass
Philadelphia, Pa

6 Cliff Street
NEW YORK, N. Y.

Cable Address "LEWIS" Providence
Cable Address "RIWELJOHN", New York
Codes ABC 5th Edition and Improved, Western Union, 5 letter Edition, Bentley's

PRODUCTS

Industrial Chemicals, Tanning Materials, Natural Dyestuffs, Crude Rubber, Crude Drugs, Gums and Spices.

ACIDS

Citric, Crystal and Powdered; Kegs—112 lb.
Formic, 85%; Boxed Carboys—66 lb.
Oxalic, Prime White Crystals; Casks—650 to 700 lb.
Tannic, Commercial Grades; Barrels—350 lb.
Tartaric, Crystal and Powdered; Kegs—112 lb., Casks—560 lb.

CHEMICALS

Acetate of Chromium; Barrels—400 to 500 lb.
Acetate of Soda; Barrels—300 lb.
Arsenic; Kegs—560 lb.
Bichromate of Potash, Casks—650 to 700 lb.
Bichromate of Soda; Casks—650 to 700 lb.
Blue Vitriol (Sulphate of Copper); Barrels—450 lb.
Caustic Potash 88/92%; Drums—700 lb.
Caustic Soda, Solid 76%; Drums—650 to 700 lb.
Caustic Soda, Ground 76%; Barrels—450 to 500 lb.
Chlorate of Potash, Crystal and Powdered; Kegs—112 lb.
Chlorate of Soda, Crystal and Powdered; Kegs—112 lb.
Chloride of Magnesium; Casks—900 lb., Drums—600 lb.
Chloride of Barium; Casks—700 lb.
Epsom Salt (Sulphate of Magnesium); Casks—600 to 700 lb., Bags—220 lb.
Naphthalene; Balls, Crystal, Crushed, Flake, Powdered, Prime White—Melting-point 79° Plus; Barrels—200 to 300 lb., Casks—500 to 600 lb., Bags—200 lb.
Nitrite of Soda 96/98%; Casks—500 to 600 lb.
Prussiate of Potash, Yellow; Casks—600 to 700 lb.
Prussiate of Soda, Yellow; Casks—500 to 600 lb.
Soda Ash 58%; Barrels—300 lb., Bags—150 to 300 lb.
Sulphide of Soda 60/62% Fused; Drums—700 lb.
Sulphide of Soda 60/62% Chipped; Barrels—500 lb.
Sulphur
  Broken Rock Brimstone, 100% Pure.
    Barrels—500 lb., Bags—250 lb.
  Roll Brimstone, 100% Pure
    Barrels—360 and 500 lb., Bags—150 lb.
  Cone Brimstone, 100% Pure
    Barrels—360 and 500 lb.
  Flour, Heavy 100% Pure
    Barrels—290 lb., Bags—125 lb.
  Flour, Light 100% Pure
    Barrels—240 and 260 lb., Bags—125 and 150 lb.
  Sublimed Flowers 100% Pure
    Barrels—155 and 250 lb., Bags—100 lb.
  Commercial Flour 99½% Pure
    Barrels—300 lb., Bags—150 lb.
  Superfine Commercial Flour 99½% Pure
    Barrels—210 lb., Bags—125 lb.
  Precipitated, 100% Pure
    Barrels—125 lb.
  Lac, 100% Pure
    Barrels—125 lb.
Zinc Oxide; Barrels—450 to 500 lb.

NATURAL DYESTUFFS AND TANNING MATERIALS

Cutch; Cases—112 lb.
Fustic Extract; Barrels—300 lb.
Gambier; Bags—150 lb., Cases—112 lb.
Hematine Crystals; Barrels—300 lb.
Hematine Paste; Barrels—400 to 500 lb.
Logwood Crystals; Barrels—300 lb.
Logwood Extract, Liquid; Barrels—400 to 500 lb
Logwood Extract, Solid; Cases—50 to 60 lb., Barrels—300 lb.
Sicily Sumac, Ground, 28%; Bags—160 lb.

CRUDE DRUGS

Barks
Herbs
Leaves
Roots
Seeds
  In original packages
Licorice Paste
  Special 88% Soluble in Cold Water

GUMS

Arabic, Clean Amber Sorts
Karaya
Tragacanth
  Packed in Bags, Baskets and Cases

VARNISH GUMS

Congo
Damar, Singapore
Damar, Batavia
Kauri
Manila
Soluble Manila
Pontianac
All East India Gums
  Packed in Bags, Baskets and Cases

SPICES

Celery Seed
Paprika
Pepper
  Packed in Bags and Cases

CRUDE RUBBER

African
Balata
Central
Gutta Percha
Para
Plantation
  In original packages

MISCELLANEOUS

Copra; Bags—200 lb.
China Wood Oil; Casks—50 Gal.
Turmeric, Ground; Barrels—300 lb.
Desiccated Cocoanut; Cases—130 lb.

THE LIQUID CARBONIC COMPANY

GENERAL OFFICES

CHICAGO, ILL.

FACTORIES

New York, N Y.
Philadelphia, Pa.
Chicago, Ill
Boston, Mass

Cincinnati, O
Dallas, Tex
Memphis Tenn
Atlanta, Ga
Long Island City, N Y

Minneapolis, Minn
St Louis, Mo
Kansas City, Mo
Pittsburgh, Pa

DISTRIBUTING DEPOTS

Birmingham, Ala
Charlotte, N C
Columbia, S C
Jacksonville Fla
Rochester, N Y

Havana, Cuba
Detroit, Mich
Indianapolis, Ind
Providence, R I.
Denver, Colo

Milwaukee, Wis

PRODUCT

Carbon Dioxide 99 9 10% Pure.

METHOD OF MANUFACTURE

Manufactured by a chemical process, then compressed to a liquid and furnished to the consumer in steel cylinders. Our method is the well known coke process which absorbs the gases formed by burning coke, in a Sodium Carbonate Solution, the bicarbonate thus made being decomposed by heating and absolutely pure carbon dioxide evolved The slight amount of impurity can, therefore, only be a trace of air and moisture. From outside appearances and in many details our plants are highly developed power plants.

PHYSICAL PROPERTIES

Carbon Dioxide is a colorless Gas with a slight pungent odor. It is heavier than air, with a density of 1.52.

The Gas is compressed at our plants to a pressure of approximately 1000 lbs per sq in depending on the temperature of the cooling water, when it forms a clear liquid slightly lighter than water The latent heat is 123 2 B. T. U. The boiling-point is 79° C. and the critical temperature 31.35° C.

USES

Carbon Dioxide, although still used to a large extent for carbonating beverages, is finding many uses in the manufacturing and chemical world

An example of the chemical use of Carbon Dioxide is in the Kolbe or Schmitt processes to manufacture Synthetic Salicylic Acid, the important dyestuff and medicinal intermediate.

Many other uses are being made and research laboratories all over the country are investigating new applications, and within the past year we have secured for new customers, many chemical concerns.

As a cheap inert gas CO_2 has no equal, and because of this, engineers are using the gas in large quantities The active basis of most fire extinguishers being the formation of Carbonic Gas, we fill large numbers of cylinders to be used in putting out fires in oil tanks, pits, or where moisture would cause damage as by short circuiting electric connections CO_2 can be used without danger to pump gasoline, and as an atmosphere which will prevent explosions.

A CO_2 cylinder is a ready source of compressed gas for power and is used in this way for atomizing liquids, inflating tires, operating switches, alarms, etc.

For small refrigerating units CO_2 has no equal and is especially valuable on battleships, in hotels and small plants where an irritating gas would be impossible to use. CO_2 is used by many physicians and dentists for local anesthesia.

CONTAINERS

CO_2 is sold by weight in steel cylinders containing from 2 oz to 50 lbs. The standard sizes are 20 and 50 lbs. and this company has thousands of such cylinders which are loaned to our customers.

SERVICE

The Liquid Carbonic Company is the oldest and largest manufacturer of liquefied Carbon Dioxide in the United States. The total annual capacity of its plants is over thirty million pounds. Double units are erected at all large centers, and by means of stocks kept at distributing depots we are in a position to give quick service to our customers. New plants are being built at New York, Pittsburgh, Chicago, and several more are being considered.

The engineers at the General Office at Chicago are always available for information and their specialized knowledge may be of service in developing a possible use of pure CO_2.

TRADE MARK
REGISTERED

THISTLE BRAND

Established 1876

DAVID McMEEKAN MANUFACTURING COMPANY

1070-1078 PACIFIC STREET, BROOKLYN, N. Y.

TRADE MARK
NIL SAP
REGISTERED

Telephone PROSPECT 2120 2121

SOUTHERN AGENTS The John M Barr Company, Charlotte, N C

PRODUCTS

Glues
- Animal
- Cold
- Fish
- Flexible
- Liquid
- Vegetable

Gums
- Liquid
- Arabic
- Tragacanth
- Karaya

Adhesives, of every description

Wall Paper Sizing, etc.

Softeners, Stiffeners and Finishes for Textiles

Oils "Mac-O" Brand
- Soluble Oil Base
- Turkey Red
- Soluble
- Sulphonated

Greases

Waxes

Starches
- Corn
- Tapioca
- Sago

Dextrine

"Nilsap"
For the softening and de-gumming of silk.

Tallows
- Vegetable
- Soluble
- Sizing
- Tallow Compound

MICA

Our connections with the miners of Mica, makes us the largest producers of Ground Mica in the World. We are therefore in a position to furnish Ground or Powdered Mica of every description at the lowest possible price consistent with quality and service.

Our No. 100 Mesh, Water Ground Mica, is washed free from Quartz and Feldspar, making same uniform, free from Grit and adapted for use in the Textile, Paper, Rubber and other industries.

We solicit inquiries and would be pleased to submit samples and quotations for either spot or future deliveries or to contract for your requirements over the year.

ADHESIVES

"Thistle Brand" Cold and Liquid Gums, Glues and Adhesives are used without heat. Have proved superior to Animal Glues at a much lower cost. For use on Automatic Machines of every description, also for hand work.

BREWERS AND BOTTLERS

Labeling Gums for use on all labeling machines, also for hand work.

SILK MILLS

Our "Nilsap" is used in softening and degumming silk, doing away with the use of expensive Oils and Soap.

"Mac-o" Soluble Oil Base for making Oils, Tallows and Grease Soluble.

PAPER MILLS

Our "Thistle Brand" Vegetable Tallow is used for the prevention of foam in the beaters, more efficient than Kerosene or Fish Oils and much lower in cost.
- Splicing Gums
- Coating Size

WALL PAPER MANUFACTURERS

- Glue Substitute
- Gold Gum
- Mica, Ground and Pulp
- Silverine
- Dextrine
- Glue

WOOLEN MILLS

"Mac-o" Soluble Oil Base for making Oils, Tallows and Grease Soluble.
- Soluble Oils, etc.

AUTOMATIC LABELING, GUMMING, WRAPPING AND SEALING MACHINE, GUM AND GLUES

We manufacture a cold liquid gum or glue to suit each individual requirement.

JOSEPH A. McNULTY

SUCCESSOR TO G. A. & E. MEYER

ESTABLISHED 1805

Direct Importer of Red Oxide of Iron and Dry Colors

114 Liberty Street
NEW YORK, N. Y.

Cable Address: "LYXSCAPEL"

PRODUCTS

Strong Turkey Red
Indian Reds
Permanent Tuscan
Turkey Red
Venetian Reds
Purple Browns
Metallic Oxides
Crocus
Rouge
Polishing Powder
Rose Pinks
Chromes
Greens
Blues
Yellow
Blacks

IMPORTERS

We are importers of the finest grade Iron Oxide and Dry Colors, specializing in Turkey, Indian, Tuscan, and Venetian Reds, in many degrees of shade and strength for the Paint, Varnish, Rubber and Paper maker.

We furnish Pure Indian Reds for paint and varnish which have been used by the largest manufacturers for years, because of the dependable quality and uniform color.

Our Permanent Tuscans are also desirable, being made from the finest iron oxide and alizarine lake properly proportioned.

We have many shades of Turkey Red and Maroon Oxides, with the proper percentage of Fe_2O_3 for the rubber manufacturers.

A fine line of Polishing Powder and Rouge for the Platers Supply Manufacturer and Glass Polishers

We supply standard grades, which can always be duplicated, the color and quality being warranted uniform.

We earnestly solicit inquiries and orders from manufacturers who desire the best Prompt and courteous attention assured

Agents in the United States for
Leech Neal & Co.'s Red Oxides.

MALT-DIASTASE COMPANY

79 Wall Street
NEW YORK CITY
Plant No. 1. 58-64 Garden St., Brooklyn Plant No. 2. Wyckoff Ave. & Decatur St., Evergreen, L. I.

PRODUCTS:

"DIAX" } De-Sizing Agents
"TEXTASE" }

WHAT "DIAX" IS:

"Diax" is a Malt product with strong diastasic properties which is used to remove STARCHES and SIZING from COTTON AND COTTON MIXED GOODS. If properly used, will remove all sizing materials from the goods without shrinking or injuring them, and will leave the goods in a softer and better condition

"Diax" is the strongest concentration of the enzymes of Malt, especially prepared under practical and scientific supervision for use in the process of BLEACHING, DYEING, PRINTING, MERCERIZING, FINISHING, and in the sizing and dressing of cotton yarns, etc.

ADVANTAGES IN THE USE OF "DIAX."

For Bleaching Purer whites are obtained, less tendency to weaken fibres, saving of time and chemicals
For Dyeing More level dyeings are obtained with economy of dyestuffs. Thorough degumming of previously dyed and finished goods is easily and cheaply performed

For Mercerizing Has increased affinity of the cloth for the caustic liquor, gives better lustre, the mercerizing lye kept clearer and lasts longer.

For Printing It is especially useful in making adhesive sizes and finishes, is less expensive, and is devoid of color and easily removable.

For Finishing Thin fluid mixings are produced which penetrate the cloth better, giving superior results in the handle and feel of the cloth, and economy in the use of starch and dextrine.

"TEXTASE":

"Textase" is very similar to "Diax" in every way except that it is not so strong.

WRITE FOR FREE SAMPLES:

Free samples of either "Diax" or "Textase" will be sent for a demonstration.

THE MATHIESON ALKALI WORKS, INC.

Cable Address
"ALKALICO", New York

EAGLE-THISTLE BRAND

GENERAL OFFICE
25 WEST 43D ST., NEW YORK, N. Y.

WORKS
Niagara Falls N. Y
Saltville, Va

BRANCH OFFICES
Hospital Trust Bldg., Providence, R. I.
Widener Bldg., Philadelphia, Pa.
Commercial Nat'l Bank Bldg., Charlotte, N. C.
Webster Bldg., Chicago, Ill.

PRODUCTS

- Caustic Soda
- Soda Ash
- Sesquicarbonate of Soda
- Bicarbonate of Soda
- Liquid Chlorine
- Bleaching Powder
- Chlorinated Solvents

CAUSTIC SODA

60%, 74%, 76% and 78% Grades "N. Y. & L." Test

Supplied in solid form, in hermetically sealed, steel drums, weighing approximately 750 lb. net.

The 78% Electrolytic Caustic (Castner Process), analyzing 98.4% Hydrate of Soda, is the purest caustic made, shipped in steel drums weighing approximately 730 lb. net.

Ground, Powdered and Flaked Caustic, packed in barrels, kegs and drums.

Pure Stick Caustic, for pharmaceutical and chemical purposes, packed in 5 and 10 lb. tins.

ANALYSIS "EAGLE THISTLE" BRAND CAUSTIC SODA

Constituents	Commercial grades				Pure stick
	60%	74%	76%	78%	78%
	Percentage content				
Sodium Hydroxide	76.07	84.00	96.27	98.4	98.07
Sodium Oxide, Na_2O actual	58.95	72.8	74.6	77.0	77.1
Sodium Oxide, "N. Y. and Liverpool"	60.9	75.2	77.1	79.5	79.7
Sodium Carbonate	2.08	1.85	2.01	1.2	1.80
Sodium Chloride	20.00	2.58	0.81	0.220	0.20
Sodium Sulphate	1.60	1.30	0.62	0.060	0.018
Sodium Sulphide	none	none	none	none	none
Silica SiO_2	0.05	0.05	0.05	0.021	0.002
Alumina and Iron Oxide				0.008	0.007
Calcium and Magnesium Carbonates	0.11	0.08	0.08	none	none

CAUSTIC BOTTOMS

60%, 74%, 76% Na_2O—"N. Y. & L." Test

Suitable for rubber regeneration, water softening, etc.

FLAKED CAUSTIC

Made in the 74% and 76% grades. Much more convenient and easier to handle than ground caustic, as it is practically free from dust and dissolves rapidly.

PURE STICK CAUSTIC, C.P.

This Caustic is made by our Castner Electrolytic Process, is molded under conditions designed to protect and preserve its high purity. It is the purest Stick Caustic made in this market, and fully equals the best products made elsewhere. Intended, particularly for use in the manufacture of pharmaceutical chemicals, for laboratory purposes, etc.

SODA ASH

Light, 58% Na_2O—"N. Y. & L." Test: Sodium carbonate 99.23%.

Shipped in bulk or in 150, 200, and 300 lb. bags, also in barrels weighing approximately 300 lb. net.

Dense, 58% Na_2O—"N. Y. & L." Test

Shipped in bulk or in 300 lb. bags, also in barrels weighing approximately 350 lb. net.

Our Dense Ash is densified in such a way, that the product is free from dirt, and particularly adapted for glass-making.

VIRGINIA SODA

(Sesquicarbonate of Soda) A modified, neutral Soda, having approximately the following composition:

Sodium carbonate	46.9%
Sodium Bicarbonate	31.17%
Water of crystallization	15.93%

Virginia Soda is particularly valuable for textile and laundry work, and the softening of hard water. Shipped in 300 lb. bags and in barrels weighing approximately 270 lbs. net.

BICARBONATE OF SODA—Standard, Powdered and Granular.

An exceptionally pure product, analyzing 99.92% $NaHCO_3$.

Shipped in bags of 200 and 300 lb., kegs of 112 lb., and barrels of 400 lb., also in 16-oz. packages, packed 60 to the case.

LIQUID CHLORINE

Our many years' experience in the manufacture of Liquid Chlorine enables us to ship this material in especially constructed one-ton containers, and 100 and 150 lb. cylinders. The only impurity is a slight trace of air, approximately 0.02%.

Our gray-painted cylinders are reserved exclusively for shipments to our water-works customers, and are carefully cleaned and inspected before refilling. The valves used on our cylinders are practically proof against injury, and it is almost impossible to strip their threads.

Our consumers of Chlorine are advised to use our one ton containers, thus saving freight and labor.

Our Technical Service Department will assist you in using Liquid Chlorine, particularly in making Bleach Liquor as needed.

BLEACHING POWDER

The manufacture of quick settling, high-test, stable Bleaching Powder, is a delicate operation. Our many years' experience includes a careful study of limes, with the result that "Eagle-Thistle" Bleaching Powder is quick-settling.

Widely used in bleaching Paper Pulp, Textiles, also in the Sterilization of Water for drinking purposes, and as a Disinfectant and Deodorant.

Shipped in steel drums, weighing net 200 lb., 325 lb., 450 lb. and 800 lb. For export, in special steel drums, wooden lined, and specially painted inside and outside, —net weight 400 lb.

SOLVENTS

Tetrachloroethane. $C_2H_2Cl_4$

This solvent weighs 13.6 lb. per gallon.

Boiling-point approximately 147° C.

Shipped in iron drums,—400 lb. and 1400 lb. net.

Trichloroethylene. C_2HCl_3

This solvent weighs 12.4 lb. per gallon.

Boiling-point approximately 85° to 88° C.

Does not corrode metal apparatus. Its boiling-point is such, that large vapor losses are avoided and low enough that exhaust steam may be used in distillation. Useful in the extraction of alkaloids, fats, oils and rubber, etc.

METALS & CHEMICALS EXTRACTION CORPORATION

LEWIS, GILMAN & MOORE, INC NATIONAL GRAPHITE CO

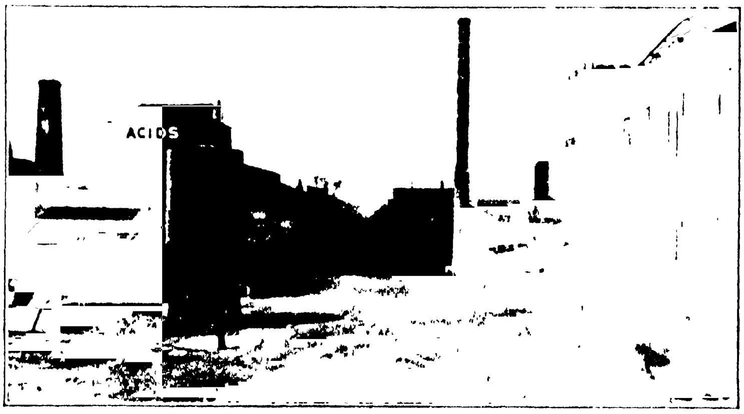
Hobart Building

SAN FRANCISCO, CALIF.

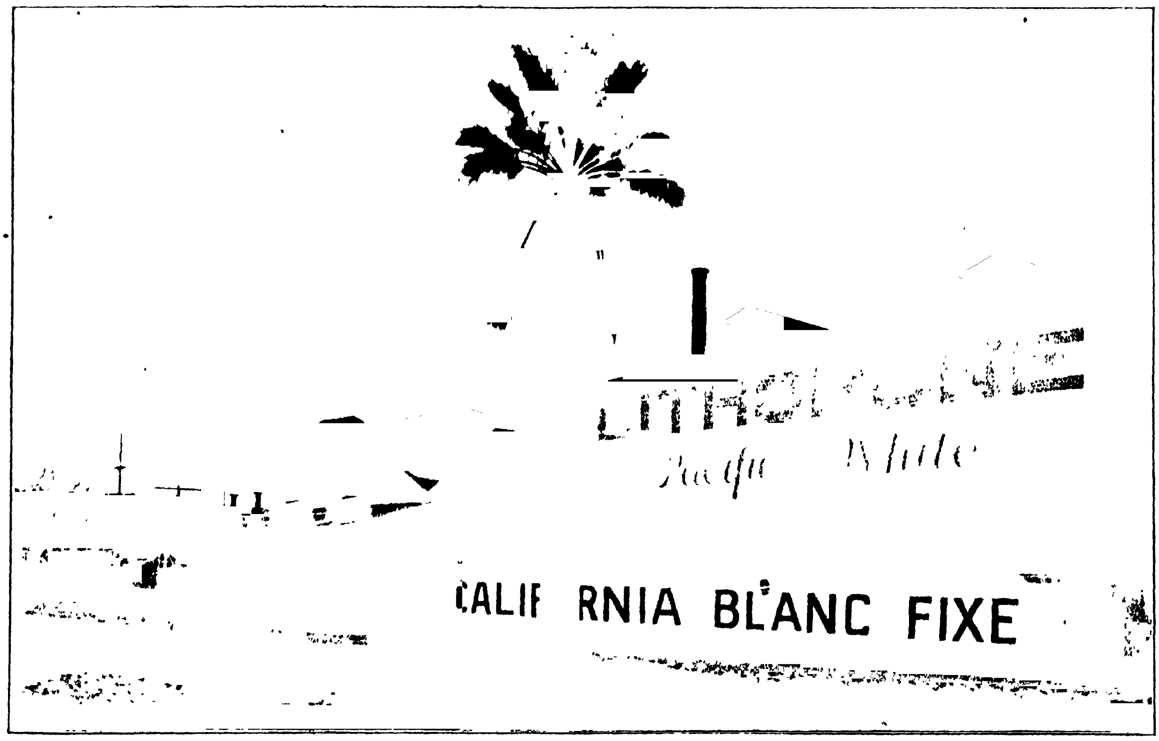
Works at Oakland, Calif. Graphite Mines, Sonora, Mexico

PRODUCTS

- "Pacific White" Lithopone
- "California" Blanc Fixe
- Barium Carbonate
- Barium Chloride
- Bleached Barytes
- Epsom Salts
- Glauber's Salts
- Salt Cake
- Muriatic Acid
- Nitric Acid
- Sulphuric Acid
- Zinc Chloride
- Graphite
- Rotary Gravure Inks



PARTIAL VIEW OF WORKS AT OAKLAND, CALIF.



PARTIAL VIEW OF WORKS AT OAKLAND, CALIF.

HA METZ CO
Trade Mark
Reg U S Pat Off

H. A. METZ & CO., INC.

122 HUDSON STREET, NEW YORK, N. Y.

Cable Address
"HAMETZ," New York

BRANCH OFFICES
Boston Mass — Philadelphia Pa
Charlotte N C — Providence R I
Chicago, Ill — San Francisco Calif

DISTRIBUTORS FOR

CONSOLIDATED COLOR AND CHEMICAL CO.
NEWARK, N. J.

CENTRAL DYESTUFF AND CHEMICAL CO.
NEWARK, N. J.

PRODUCTS
- **Beta-Naphthol**
- **Para-Nitraniline**
- **Hydrosulphites**
- **Dyestuffs**
  - Acid
  - Basic
  - Chrome Colors
  - Direct Cotton
  - Nigrosines
  - Sulphur Colors
- **Oil Colors**
- **Wood Stains**

ACID COLORS
- Acid Navy Blue B
- Amaranth
- Azo Rubine
- Bordeaux B
- Croceine Scarlet
- Erythrine
- Fast Acid Red C2B
- Fast Red
- Naphthol Blue Black
- Orange G
- Orange I
- Orange Y
- Scarlet 2R
- Victoria Scarlet 3R
- Wool Violet RS

BASIC COLORS
- Bismarck Brown R
- Bismarck Brown Y
- Chrysoidine R
- Chrysoidine Y
- Malachite Green
- Methylene Blue
- Methyl Violet 3B

CHROME COLORS
- Alizarine Brown RG
- Chrome Black A
- Chrome Green CC
- Chrome Green G
- Chrome Yellow 2R
- Chrome Yellow 3G
- Chrome Yellow 5G
- Delphine Blue
- Gallocyanine

DIRECT COTTON COLORS
- Benzopurpurine 4B conc
- Centraline Black BH
- Centraline Blue 2B
- Centraline Blue 3B
- Centraline Violet N
- Centraline Fast Red F
- Direct Black
- Direct Blue 2BO
- Direct Blue H2G
- Direct Dark Green C
- Direct Yellow CJ
- Direct Yellow DG

NIGROSINES
- Base
- Spirit Soluble

SULPHUR COLORS
- Sulphur Blue 3B
- Sulphur Brown C3R
- Sulphur Brown K
- Sulphur Brown 2F
- Sulphur Cutch R
- Sulphur Fast Yellow G
- Sulphur Maroon R
- Sulphur Olive O
- Sulphur Olive OD
- Sulphur Orange Brown
- Sulphur Tan Conc.
- Sulphur Yellow R

DYESTUFFS
- Vat colors such as
- Algol
- Hydron
- Helindon Blues

and other colors not obtainable from American manufacturers will be imported upon licenses issued by the War Trade Board.

Central and Consolidated Dyestuffs are scientifically produced in modern, efficiently maintained plants, by thoroughly experienced chemical engineers. They are always uniform in composition, and in all respects as good as their equivalents produced in or imported into this country in the past.

USES

Dyeing cotton, wool, and silk yarns and textiles; coloring paper pulp and paper; producing writing, printing, lithographing, engraving, typewriter-ribbon, and rubber stamp-pad inks; dyeing and staining fur, leather and felt; pigmenting waxes, shoe and leather dressings, manufacturing color lakes.

DEVELOPMENT

We are from time to time adding new dyestuffs to our extensive list, so as to be able to meet the constantly increasing demand for "Made-in-America" dyestuffs.

SERVICE

Our chemists, dyestuffs experts, and our color-matching facilities are always available to assist you with your problems and difficulties in matching shades, selecting the appropriate dyestuff for a particular use, and in obviating disturbances in the operation of your dyehouse.

J. MEYER & SONS

Manufacturing and Importing Chemists

480-482 BOURSE BUILDING
PHILADELPHIA, PA.

Cable Address
"Meyerlus"

PRODUCTS:

Chemicals for the Varnish, Paint, Glass, Steel, Oil Cloth, Printing Ink and Linoleum Trades. A full line of Varnish Gums.

RESINATES Precipitated:

- Manganese Resinate
- Lead Resinate
- Zinc Resinate
- Calcium Resinate

RESINATES Fused:

- Manganese Resinate
- Lead Resinate
- Zinc Resinate
- Cobalt Resinate

LINOLEATES:

- Manganese Linoleate
- Lead Linoleate
- Calcium Linoleate

STEARATES:

- Calcium Stearate
- Zinc Stearate
- Aluminium Stearate

MANGANESE COMPOUNDS:

- Manganese Sulphate
- Manganese Oxide, all grades
- Manganese Chloride
- Manganese Borate

VARNISH GUMS:

- Kauri Gum
- Manila Copal
- Damar Gum
- Pontianak Gum
- Ester Gums

HARDENING POWDER FOR ROSIN

UMBER, BURNT AND RAW LUMP

THE MINER EDGAR COMPANY

WAREHOUSES
Brooklyn N. Y.
Newark N. J.
Cable Address
"MINORCA" New York

Manufacturers of
Wood Alcohol, Solvents, Lacquers and Clays
MAIN OFFICE
110 WILLIAM STREET, NEW YORK, N. Y.

PLANTS
Newark, N. J.
Monmouth Junction, N. J.
Sutton W. Va.
Stamford, Vt.
Rail & Water Facilities

Trade Mark

PRODUCTS

CLAY DEPARTMENT

Washed and Refined Clays for the manufacture of:
- Book Paper
- Wall Paper
- Coated Paper
- Newspapers
- Dry Colors
- Paints and Kalsomine

Crude clays for news and wall paper mills. This is pulverized clay washed before pulverizing, insuring a uniform, absolutely gritless product.

CHEMICAL DEPARTMENT

Acetic Acid
Acetate, Amyl
  Butyl
  Ethyl
  Methyl
Acetone, pure
Methylacetone
Formaldehyde
Alcohol, completely denatured
Alcohol, specially denatured (all authorized formulas)
Alcohol, Methyl, in following grades:
  C. P. Methyl Alcohol
  Refined Wood Alcohol, all grades
  Wood Alcohol, denaturing grade
"Mecco" Spirits (Turpentine Substitute)
Acetone oils

SERVICE

Put our research department to work for you.

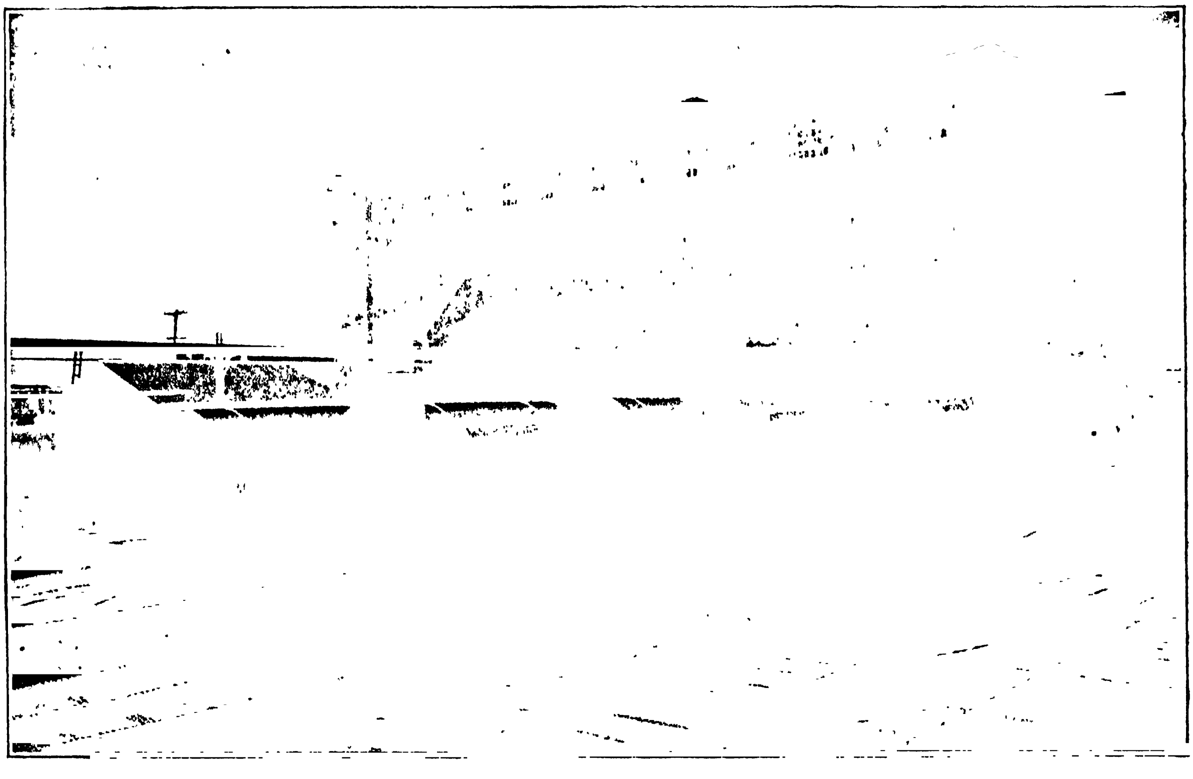
Many consumers of Solvents and Cotton Solutions are availing themselves of the services of this department, the personnel of which is made up of technical experts in the manufacture and uses of Solvents and Cotton Solutions.

We will assist you in successfully and economically meeting conditions which present themselves from time to time, and work with you in devising, developing and perfecting formulas and new processes to meet your particular requirements as they may be affected directly or indirectly by buying and selling conditions.

The production of Miner Edgar Solvents and Cotton Solutions is the culmination of a series of successive operations beginning with the mining of coal at our own mines, through the various steps involved in the manufacture of intermediates, and finally through to the finished products.

But this is where we stop, and therefore we are not competing with our customers.

The magnitude of our resources for crude materials from which most of our finished products are made, renders us independent of outside sources for our essential crude and intermediate materials, assuring our customers a steady and dependable source of supply.



OUR NEWARK, N. J. WAREHOUSE AND THREE OF OUR FLEET OF TANK CARS

THE MITCHELL LIME COMPANY

111 West Washington Street
CHICAGO, ILL.
PLANTS AND QUARRIES Mitchell, Indiana

Trade Mark

PRODUCTS

Mitchell Chemical Lime and Mitchell Hydrated Lime.

MITCHELL LIME

Mitchell Lime is calcined by experts from the finest hand-picked limestone. No shipment is released until it has passed our exacting inspection. Mitchell is recommended for use only after a careful study has been made of the particular requirements of the individual plant. These three facts are in themselves sufficient to account for the wide use of Mitchell Lime in chemical and metallurgical manufacturing.

A request for information regarding the specialized service accompanying the sale of Mitchell, will be given prompt attention. The value of this service has been demonstrated in the following industries

Agriculture
- Bacteria (Protection of)
- Direct Use on the Soil
- In Prepared Fertilizer
- Insecticides
- Lime and Wood Ash Mixtures
- Spraying Material

Building and Construction
- Gypsum Products
- In Concrete
- Mortar
- Plaster
- Sand-Lime Brick
- Slag Brick
- Stucco

Caustic Alkali Works
- Ammonia
- Caustic Soda
- Potash Salts
- Soda Ash

Explosives
- Cyanamid
- Gelatine
- Glycerine
- Nitrates
- Preparation of Gun Cotton

Chemical Works
- Alcohol
  - Dehydrating of
  - Manufacture of
  - Wood Distillation
- Barium Products
- Bleaching Powder
- Bone Ash
- Calcium Acetate
- Calcium Carbide
- Manufacture of Acids
- Phenol
- Potassium Cyanide
- Precipitated Calcium Carbonate
- Recovery of Potash
- Salt Refining
- Sodium Cyanide
- Dyestuffs
- Glue Manufacture

Coke and Gas Manufacture
- Coal Gas and Water Gas Purification
- Coke Oven By-products
- Gas Plant By-products

Leather Goods
- Morocco Leather Industry
- Tanneries
- Dehairing Wool

Glass Manufacture
- Bottle Glass
- Glass Tubing
- Glass Ware
- Optical Glass
- Plate Glass
- Window Glass

Metallurgy
- Aluminum Manufacture
- Brass Manufacture
- Electric Furnace Flux
- Iron Blast Furnace Flux
- Metal Pickling
  - Recovery of Copper from Smelter Chimney Dust
- Recovery of Gold
- Smelter Flux
- Steel Manufacture
- Steel Purification
- Detinning

Miscellaneous Industries
- Asphalt Industry
- Cork Carpet and Linoleum Manufacture
- Corn Products Manufacture
- Cotton and Thread Manufacture
- Flour Manufacture
- Medical and Proprietary Uses
- Polishing and Buffing Compounds
- Porcelain Manufacture
- Pottery Manufacture
- Precipitated Chalk Manufacture
- Print Works
- Rubber Manufacture
- Pharmaceutical Products
- In mixture with glue for Veneer Construction

Oil, Fat and Soap Manufacture
- Candles
- Glycerine
- Lubricating Grease
- Neutralizing Acidity of Oils
- Renovation of Butter
- Renovation of Grease
- Soap

Paint Manufacture
- Calcimine
- Cold Water Paints
- Putty
- To Hold Heavy Materials in Liquid Suspension
- Varnish
- Whitewash

Paper Industry
- Cooking Paper Stock
- Rag Process
- Soda Process
- Straw Board
- Sulphate Process

Refractory Materials
- Ganister Brick

Sanitation
- Chloride of Lime
- Disinfectants
- Neutralization of Acid Water
- Prevention of Putrefactive Ferments
- Sewage and Garbage Purification
- Water Purification
- Water Softening

Sugar Manufacture
- Refining
- Recovery of Milk Sugar from Whey

FREDERICK W. WHITE, President
HERBERT M. KAUFMANN, Vice-President and Gen. Manager

MUTUAL CHEMICAL COMPANY OF AMERICA

Manufacturers Exclusively

110 WILLIAM ST., NEW YORK, N. Y.

Cable Address, "BICHROME," New York
A. B. C. CODE, 4th, 5th and 6th Edition
WESTERN UNION 5 LETTER Edition

FACTORIES
JERSEY CITY, N. J. BALTIMORE, MD.
BALTIMORE WORKS FOUNDED IN 1846

PRODUCTS

- Bichromate of Soda
- Bichromate of Potash
- "Koreon"
- Sulphuric Acid

BICHROMATE OF SODA (Sodium Bichromate)

$Na_2Cr_2O_7 \; 2H_2O$

Mutual Standard

Uniformity

66½ to 67¼% Chromic Acid

Dissolves in water with practically no residue

Small crystals and Large crystals

Shipping Containers

Wooden casks containing about 700 pounds

Uses

Chrome tanning of leather,
Mordant in textile dyeing,
Oxidizing agent,
Insolubleizing gelatin and gums,
Bleaching oils, waxes and sponges,
Waterproofing fabrics,
Battery fluid,
Production of chromic acid,
Substitute for potassium bichromate.

SULPHURIC ACID

H_2SO_4

Strength 60° Bé

Made from brimstone at our Jersey City factory.

Shipping Containers

Tank cars of about 7000 gallons capacity.

BICHROMATE OF POTASH (Potassium Bichromate)

$K_2Cr_2O_7$

Mutual Standard

Uniformity

67½ to 68% Chromic Acid

Dissolves in water with practically no residue

Crystals and Powdered

Shipping Containers

Wooden casks containing about 775 pounds

Uses

Chrome tanning of leather,
Mordant in textile dyeing,
Oxidizing agent,
Insolubleizing gelatin and gums,
Bleaching oils, waxes and sponges

"KOREON"

Trade name for a Basic Chromium Sulphate preparation of the same standard of uniformity and excellence as all Mutual products

Dissolves readily in water to a clear solution.

Shipping Containers

Wooden casks containing about 500 pounds.

Uses

Tanning hides and skins by the "one-bath" chrome tanning process.

NATIONAL ANILINE & CHEMICAL CO., INC.

21 BURLING SLIP, NEW YORK, N. Y.

Cable Address
"JUBILANT," New York

BRANCH OFFICES

Akron O
Boston Mass
Charlotte N C
Chicago Ill
Montreal P Q
Hartford Conn
Philadelphia Pa
Providence R I
San Francisco Calif
Toronto Ont

WORKS

Buffalo N Y
Brooklyn, N Y
Marcus Hook Pa

PRODUCTS

Dyestuffs
Intermediates
Organic Chemicals
Certified Food Colors

DYESTUFFS

In the "National" line will be found a complete range of colors in the Acid, Basic, Chrome, Direct and Sulfur groups of dyes, as well as Developed Black, Blue and Red, Alizarine Blue, Orange and Red, Nigrosine, Indigo, Alkali Blue, Spirit Oil colors, Vat Black and Blue and Miscellaneous Bases Type for type our line of nearly 300 dyes is equal to any made in the United States or imported into this country.

INTERMEDIATES AND OTHER COAL-TAR DERIVATIVES

Below is a list of some of the principal intermediates and other coal-tar derivatives of standard quality that the National offers to the trade These products are of technical importance to producers of textiles, dyestuffs, chemicals, pharmaceuticals, rubber products, photographic materials, paints, disinfectants, insecticides, etc.

Amido—1 5 Acid
Amido—H Acid
Aniline Oil
Aniline Salt
Benzidine Base
Cleve's Acid
Chromotropic Acid
Dimethylaniline
Dinitrobenzene
Dinitrotoluene
H Acid
Hydroquinone
Koch Acid
Metanilic Acid
Meta-Toluylenediamine
Methylene Blue, Medicinal, U. S P
Mixed-Toluidines
Naphthionate of Soda

Nitrobenzene
Nitrotoluene
Nitroxylene
Oil of Myrbane
Ortho-Nitrotoluene
Ortho-Toluidine
Para-Aminoacetanilide
Para-Nitrosodimethylaniline
Para-Nitrotoluene Sulfonic Acid
Para-Toluidine
R Salt
Resorcin
Schaeffer Salt
Sulfanilic Acid
Thiocarbanilide
Triphenylguanidine
Xylidine

CERTIFIED FOOD COLORS

These are manufactured to meet the stringent requirements of the U. S. Department of Agriculture, as to methods of manufacture, cleanliness and purity Every pound is certified as being in conformity with the government specifications. It receives a certification number, which is plainly marked on each package.

The "National" Certified Primary Colors are as follows

Amaranth No. 107
Ponceau 3R 56
Erythrosine No. 517
Tartrazine No 94
Orange 1 No 85
Yellow A B
Yellow O B
Light Green S F Yellowish No. 435
Sodium-Indigo Disulfonate No 692

In some instances the primary colors do not produce the exact shades required. For such cases mixtures or blends are made, which are designated as secondary shades, and are again certified to the Bureau of Chemistry, U S. Department of Agriculture.

The following list gives an idea of the variety of shades thus produced:

Bordorine
Ceylene
Kerine
Rajah
Rubaline
Sulta
Benga
Vinta
Myrtine
Celetine

Noka
Rana
Jonquiline
Sitro
Mongola
Yolcone
Solona
Bruno
Toki
Perigee

Plumna

Additional shades now in process will be announced when ready.

SERVICE

The Company maintains fully equipped laboratories and an experienced technical staff which are at the disposal of our customers without charge. Shade cards containing colors produced under actual dyeing conditions of the various trades are prepared for distribution to interested parties Samples, prices, special formulæ, dyeing instructions and advice in meeting specific dye problems are freely offered to our customers.

INQUIRIES

May be addressed to our main office or the nearest sales office, and will receive prompt and careful attention.

EXPORT

Foreign buyers should address their inquiries to
NATIONAL ANILINE & CHEMICAL CO., INC.,
Export Department,
21 Burling Slip,
New York, N. Y.

NATIONAL ROSIN OIL & SIZE CO.

90 WEST STREET, NEW YORK, N. Y.

FACTORIES
Savannah Ga. Elizabeth N. J

WESTERN OFFICE AND WAREHOUSE
Ashland Block, Chicago, Ill

PRODUCTS

- Rosin Oil
- Pitches
  - Pine
  - Navy
  - Burgundy
  - Brewers'
- Weatherproofing
- Insulating
- Venice Turpentine
- Pine-tar
- Pine-tar Oil

ROSIN OIL

There are so many different processes used in the manufacture and refining of rosin oil, resulting in the production of so many different grades, that it cannot be stated that Rosin Oil in general has any salient characteristics. As a result, it can be adapted to a very great variety of uses. However, all pure rosin oils have as their basis the distillate of pure gum rosin. The various fractions of the distillation differ greatly, and a vast difference can be made in the nature of an oil by the temperature at which the distillation is conducted. All of these oils can be altered by one or more redistillations, blending of the various grades, deodorization and dehydration. Consequently, the color can be varied from a pale yellow through various shades of red to black, the viscosity from the consistency of the heaviest molasses to that of a thin paraffin oil, the acidity from 60 per cent. to neutral, and the odor from a strong characteristic pine odor to odorless.

In addition to the many grades of oil that are distillates of gum rosin, there are other varieties of so-called rosin oils. The first and most important of these are the oils that are blended with petroleum oils. There is a legitimate field for such oils, as they are cheaper than the pure distillates and highly efficient for many purposes.

We will never sell a blended oil until we have told our customer just what he is getting.

Some so-called Rosin Oils are made from dross, a waste product of the rosin still, or from dead pine wood, either directly or by the use of wood rosin derived from such wood. All such oils are inferior as they are apt to be dirty or to lack life even though their appearance may be good.

We positively guarantee all of our oils, whether pure or blended, to be made from pure gum rosin extracted from the living pine tree.

GREASE OILS

Rosin Oil is used extensively in the manufacture of greases and we recommend the following grades:

Monarch Oil, Kidney Oil, No. 56 Kidney Oil, Atlas Oil, Bloom Oil, National Oil and Magic Oil.

PRINTING INK OILS

This class of trade is most particular in its Rosin Oil requirements, and we cater to this trade. Our many years of experience have taught us the best oils for this use are:

Deodorized Second Run, Second Run Plain, and our Fourth Run EE Oil.

We also manufacture printing ink varnishes of various grades.

BELT OILS

For the saturating of canvas belting we recommend our Gandy Oil, also our No. 300 Oil.

RUBBER MANUFACTURERS' SUPPLIES

Among the largest users of our oils are numbered many internationally known rubber manufacturers and reclaimers. Their ideas as to which oils are best suited for their purpose vary widely and we are often called upon to produce special oils for them. Some of the most popular oils for the rubber industry are as follows:

No. 3 Deodorized, No. 556 and No. 342 Oil.

INSULATING OILS AND COMPOUNDS

Insulating experts agree that for saturating paper cables, Rosin Oil has many desirable properties which cannot be obtained with any other compound. We recommend

Dark Excelsior Oil, Blue Billy Oil and our Insulating Oil.

OIL-CLOTH AND LINOLEUM OILS

Our Dark Excelsior and No. 305 Oils are used extensively in this industry.

PITCHES

There are various grades of Pitch manufactured and we make all of them except the Coal-tar and Asphaltum Pitches which, although satisfactory for some purposes, cannot take the place of Rosin Pitches in others. Many years of experience have taught us what the ship chandlers, brush-makers, roofing manufacturers, druggists and brewers require, and where our Pitches are used, perfect satisfaction is given. We manufacture:

Caulking Pitch, Insulating Pitch, Brewers' Pitch, Brush Pitch and Burgundy Pitch.

Also various other special pitches.

ISOLENE

This is a product manufactured from Rosin and is used extensively in the manufacture of paper cables. Isolene is free from moisture, high in acid and uniform, and produces a more flexible cable. Isolene also will make a tougher cable and will not crystallize, as is the case with Rosin.

We will gladly furnish samples on request.

SEND FOR OUR BOOKLET ENTITLED "PINE TREE PRODUCTS"

NATIONAL SALES COMPANY

Miners and Importers

31-35 East 13th Street

CINCINNATI, OHIO

Cable Address
"NASACO" Cincinnati

PRODUCTS
- Arsenic
- Asbestos
- Barium Sulfate
- Barytes, Crude
- Bauxite
- Bentonite
- Bog Iron Ore
- Calcium Chloride
- Calcium Carbonate
- Calcite
- Clay
  - Acid-proof
  - Ball
  - Bleaching
  - China
  - Crucible
  - Fire
  - Glass-pot
  - Modeling
  - Pulverized
  - Refractory
- Cobalt Oxide
- Colloidal Clay
- Concrete Hardener
- Cotton Duck
- Chrome Ore
- Chromite
- Crucibles
- Feldspar
- Ferro-Chromium
- Ferro-Manganese
- Filter Bags
- Filter-press Bags
- Filter Cloths
- Filtering Mediums
- Fluorspar
- Filter Earth
- Fire Brick
- Flint Pebbles
- Flint, Ground
- Floor Hardener
- Fuller's Earth
- Ganister
- Gas Purifying Oxide
- Glue, Powdered
- Infusorial Earth
- Insulating Materials
- Iron Oxide
- Kaolin
- Kieselguhr
- Limestone, Powdered
- Magnesite
  - Brick
  - Calcined
  - Caustic
  - Crude
  - Dead Burned
- Magnesium Chloride
- Manganese
- Marble Dust
- Mica
- Mineral Fillers
- Ocher
- Paris White
- Press Bags
- Pumice, Powdered
- Pyrites
- Quartz for Acid Towers
- Quartz, Ground
- Quartz Rock
- Refractory Cements
- Silex Linings
- Silica, Ground
- Silica Sand
- Talc
- Tripoli
- Volcanic Ash
- Whiting
- Zirconium

NATURAL CARBONIC GAS COMPANY

Producers of Carbon Dioxide, Liquefied, of Exceptional Purity

McCLELLAN STREET, NEWARK, N. J.

WORKS Waverly, N J

PRODUCT

Carbon Dioxide

FACILITIES

Our works, located in Newark, N. J., consisting of three separate and distinct plants, form the largest single Carbonic Gas producing plant in the United States and are equipped to produce Carbon Dioxide of exceptional purity. This consolidation of large producing capacity in several plants at Newark, N. J., which is an ideal shipping point for supplying the trade in the eastern states, and the concentration of our facilities at this point affords the opportunity of keeping every detail of the manufacture of our product under the control of our experts.

We use the efficient and reliable coke process, in which coke is burned, the gases formed being used to convert Sodium Carbonate in solution into the Bicarbonate. This is decomposed by heat yielding Carbon Dioxide, which is exceptionally free from impurities other than air and water, but which is further purified to reduce these impurities to a minimum.

The resulting Carbon Dioxide Gas is compressed, yielding Liquefied Carbon Dioxide, which is furnished to the user in the usual steel cylinders or gas bottles.

PHYSICAL CONSTANTS

Gas: Specific gravity 1.53.

Liquid: Specific gravity 0.813; Melting-point −69°F.

Latent heat 123.2 B. T. U.; Critical temperature −88°F.

One pound of Carbon Dioxide is equivalent to about 8.25 cubic feet of gas at 32°F. and at atmospheric pressure.

USES

In addition to its usual and long-standing utilization for carbonating beverages, Carbon Dioxide has many important uses in the chemical and other industries.

Among the former may be mentioned the manufacture of ammonium carbonate, the conversion of barium sulfide into the carbonate, and the production of synthetic salicylic acid.

In the production of sugar, especially beet sugar, the juice from the beets is treated with milk of lime, after which Carbon Dioxide is passed through it. This has the effect of removing certain impurities from the juice.

In the manufacture of white lead Carbon Dioxide is used in the "Carter" Process.

Being the cheapest inert gas available, increasing quantities of Carbon Dioxide are being used in many industrial processes among which the following are mentioned:

In the manufacture of rubber goods, where the product is inflated while being molded; or in molding of rubber goods under pressure.

For extinguishing fires, particularly in oil tanks and pits where water would be useless. Fires where there are many electrical connections which would be short-circuited by water are best extinguished by the use of Carbon Dioxide.

For power purposes, particularly where there is danger of fire, such as pumping gasoline, atomizing liquids, inflating tires, operating railway signals, etc., as well as for creating a non-explosive atmosphere above dangerous liquids.

For refrigeration, especially in small units, and where ammonia would be too dangerous and hazardous, as in hotels, on ships, etc.

For local anesthesia in surgery and dentistry.

For carbonating water for medicinal baths.

For food preservation by surrounding milk, fruits, meat and the like, with an atmosphere of CO_2.

In the chemical laboratory Liquid Carbon Dioxide finds extensive use for producing low temperatures, as low as −78°C. By allowing a mixture of Liquid Carbon Dioxide and ether to evaporate in a vacuum the temperature can be reduced to −110°C.

CONTAINERS

Carbon Dioxide is furnished in **sealed** cylinders of two sizes, (a) containing 20 pounds, and (b) containing 50 pounds of Liquefied Carbon Dioxide.

SERVICE

Our staff of chemists and engineers will gladly assist users of CO_2 in any form, in obviating any difficulties encountered.

Prospective users of Carbon Dioxide will find our technologists ready at all times to assist in developing their processes, and to furnish any advice required.

NIAGARA ALKALI COMPANY

NIAGARA FALLS, N. Y.

NEW YORK OFFICE 18 EAST 41ST ST

PRODUCTS

Caustic Potash, 88 to 92%

Average Analysis

Total Alkali,	88 to 92%
Potassium Chloride,	1.2 to 1.6%
Potassium Carbonate,	2.5 to 3.5%

	Containers	Dimensions
Broken Lump	100-lb. drums	14" x 23"
Solid	100-lb. drums	12" x 15"
Solid	700-lb. drums	21" x 32½"
Flaked	100-lb. drums	14" x 23"
Flaked	300-lb. drums	21" x 32½"

Other sizes on special order

Our Flaked Potash affords a ready means of making potash solutions of any desired strength with a minimum of time, effort and material

48° Be. Caustic Potash Solution

Average Analysis:

Total Alkali,	44 to 46%
Potassium Chloride,	0.6 to 0.8%
Potassium Carbonate,	1.2 to 1.7%

Returnable Steel Drums, 50 gals., 21" x 33"
Returnable Steel Drums, 100 gals., 32" x 43"

Caustic Soda

Electrolytic
74% Actual Na_2O; 76% N. Y. & L.

Average Analysis

Sodium Hydrate,	95.52%
Sodium Carbonate,	1.50%
Sodium Chloride,	2.77%
Sodium Sulphate,	0.11%
Sodium Sulphide,	none
Sodium Silicate,	0.16%
Sodium Oxide (Na_2O),	74.90%

	Containers	Dimensions
Solid	100-lb. drums	12" x 15"
Solid	700-lb. drums	21" x 32½"
Flaked	100-lb. drums	14" x 23"
Flaked	300-lb. drums	21" x 32½"

Flaked Soda is meeting with a favorable reception where facility in handling, ease of dissolving, uniformity and freedom from waste are desirable

45° Be. Caustic Soda Solution

Returnable Steel Drums, 50 gal., 21" x 33"
Returnable Steel Drums, 100 gal., 32" x 43"

Bleaching Powder

Average Analysis:
35 to 37% Available Chlorine

Containers	Dimensions
800-lb. steel drums	30" x 39½"
300-lb. steel drums	21" x 33"
350-lb. wooden barrels	22" x 35"
100-lb. steel drums	16" x 20"
10-lb. cans	7" x 9⅝"

Muriatic Acid

Average Analysis

Specific Gravity,	20° Be
Acidity as HCl,	31.45%
Non Volatile Matter,	0.089%
Iron,	0.0072%
Aluminum,	0.0054%
SO_4 (Sulphates),	0.0045%
Free Chlorine,	0.0105%
Lead,	none
Arsenic,	none

Containers.
Tank cars, or carboys

Please note that our Acid is entirely free from arsenic, lead or free sulphuric acid.

Permanganate of Potash

Technical, 97 to 99% $KMnO_4$
U. S. P., 99% Minimum $KMnO_4$

Containers	Dimensions
25-lb. steel drums	12" x 6½"
50-lb. steel drums	12" x 12"
100-lb. steel drums	14" x 16¼"
250-lb. steel drums	21" x 19"

Monochlorobenzol

Description—Water-white
Distillation
Below 127° C., no distillate
Below 129° C., not more than 5% by volume
Between 129°–133° C., not less than 90% by volume
Between 133°–134.5° C., not more than 5% by volume
Specific Gravity, 1.103 to 1.109 at 20° C. against water at 15° C.

Containers.
100 gal., Returnable Steel Drums, 32" x 43"
Tank Cars

Para-Dichlorobenzol

Description—White Crystalline Material
Melting-point about 53° C.
Ash, 0.025% to 0.05%

Containers.
130-lb. wood kegs
300-lb. standard wood barrels

Ortho-Dichlorobenzol

Description—Straw Colored Liquid
Boiling-point 176°–179° C.
Specific gravity, 1.280–1.350 at 15° C.

Containers	Dimensions
100-gal. steel drums	32" x 43"

NEWPORT CHEMICAL WORKS, INC.

TRADE MARK
"COAL TO DYESTUFF"
Reg. U. S. Patent Office

PASSAIC, N. J.

Cable Address
"NEWPOCHEM", Passaic

BRANCH SALES OFFICES
Boston, Mass   Philadelphia, Pa   Providence, R. I   Chicago, Ill   Greensboro, N. C

PRODUCTS

Dyestuffs
  Newport Series
Guaiacol
Intermediates
Sodium Silicate
Zinc Oxide
Zinc Chloride

COAL TO DYESTUFF

The high quality of our products is made possible because the whole process of manufacture is performed by us. This includes Mining the coal, coking the coal; recovering the by-products Benzol, Toluol, Naphthalene, etc.; manufacturing from these products the various intermediates required; followed by the manufacture of the dyes themselves.

All dyestuffs are subjected to a careful standardization before delivery. This insures uniform shipments so that the user can be sure that each lot he receives is exactly like all preceding ones

Our policy is "quality first" always, plus the determination to build a permanent 100% American Dyestuff industry.

DYESTUFFS

At present we are producing dyestuffs as listed below, and are in a position to make immediate deliveries. They are in all respects the equal or superior of any imported dyestuffs available here in the past, either by direct importation, or by manufacture from imported intermediates.

They have been and are continuing to be used with highly satisfactory results in all branches of the textile industry, as well as by fur-dyers, manufacturers of inks of all kinds, paint-makers, varnish manufacturers, precipitation of lakes, in the wood-working industries for staining and coloring, and for the coloring of food products.

Being part of the "Coal to Dyestuff" system they are produced to create and maintain a standard.

Acid Black 4AN
Acid Blue Black Conc.
Acid Blue Black Extra Conc.
Acid Bordeaux B Conc.
Acid Fuchsine
Acid Navy Blue BG
Acid Navy Blue BR
Acid Phloxine GR
Acid Red 2B Extra
Acid Red 6B Extra
Acid Red OTH
Acid Scarlet 2R
Acid Violet 4BS
Acid Violet 6R
Amaranth
Anthrene Blue GC, Paste
Anthrene Blue GCD, Paste
Anthrene Blue RS, Paste
Anthrene Brown BB, Paste
Anthrene Dark Blue BO, Paste
Anthrene Green B, Paste
Anthrene Yellow G, Paste
Azo Dark Green B
Azo Eosine G
Azo Eosine 2B
Azo Rubine R
Benzoazurine G Extra
Benzopurpurine 4B Conc.
Benzopurpurine 10B Conc.
Chrome Blue G Extra
Chrome Blue Black V
Chrome Blue Black V Conc.
Chrome Green C
Chrome Green N
Chrome Orange 2G
Chrome Red A4B
Chrome Yellow G
Chrysophenine Extra
Chrysophenine XXX Conc.
Congo Red 4B
Congo Red R
Developed Black BH Extra Conc.
Developed Black SC
Developed Black 2BN
Diazo Black RS
Direct Black EE, Extra Conc.
Direct Black 2G
Direct Black RW
Direct Blue 2B Conc.
Direct Blue BXG
Direct Blue 3B
Direct Blue 3R
Direct Brilliant Blue G
Direct Brilliant Violet R Conc.
Direct Brown GR Extra
Direct Brown GNR
Direct Brown RB
Direct Fast Blue RW
Direct Fast Brown MB
Direct Fast Red F
Direct Fast Scarlet 6BX
Direct Fast Yellow NN
Direct Garnet R
Direct Green B
Direct Green BXM
Direct Green GXM
Direct Green G
Direct Green 2GB
Direct Green 2Y
Direct Heliotrope B
Direct Orange R
Direct Orange 2R
Direct Orange 2RG
Direct Pink 2B
Direct Sky Blue
Direct Sky Blue FF
Direct Sky Blue 6B
Direct Steel Blue G

Continued on Next Page

Direct Violet N
Direct Yellow G
Fast Acid Blue GG
Fast Acid Violet 10B
Fast Black V
Fast Black VC Extra
Fast Egyptian
Fast Red A
Fast Silk Gray MB Conc.
Lana Fuchsine B
Neutral Gray G
Oil Blue B
Oil Orange Extra Conc.
Oil Red 3BX
Oil Scarlet R
Oil Yellow
Primuline Extra Conc.
Rhodamine B Extra
Roccelline
Sulphur Blue RX
Sulphur Blue 4BXG
Sulphur Green G
Sulphur Indigo Blue B
Sulphur Indone 2R
Sulphur Indone 3B
Vat Dyes, see Anthrene
Wool Black B

It is our intention to add from time to time, additional dyestuffs to the above, so that we may always be in a position to fully meet all the demands of the American textile and allied industries.

Users of dyestuffs, who are unable to find available the particular dyestuffs to meet their special conditions are invited to lay their requirements before us, with assurance that these requirements will receive all the attention we can give them.

We maintain the fullest facilities for matching shades, solving dye-house difficulties and problems, and are always ready to serve our clients.

INTERMEDIATES

In the course of our process "Coal to Dyestuff," we are producing not only the intermediates required for manufacturing the Newport series of dyestuffs, but also the following which, of course, are of the usual Newport standard of quality, and immediately available:

Alpha-Naphthylamine
Benzidine
Cleve's Acid
Dianisidine
Gamma Acid
H Acid
N-W Acid
Nitronaphthalene
Nitrotoluene, Ortho-
Nitrotoluene, Para-
R Salt
Sodium Naphthionate
Tolidine
Tolidine Sulfate
Toluidine, Ortho-
Toluidine, Para-

We are adding to this list as rapidly as manufacturing conditions permit, and the demand requires. Inquiries for intermediates not listed, will receive careful attention and consideration.

GUAIACOL (Ortho-dihydroxybenzene methyl ester) $C_6H_4OH \cdot OCH_3$

We produce this in one quality only, complying in all respects with the requirements of the United States Pharmacopeia.

Grades: Liquid and Crystal. The latter when melted may remain liquid for a long period of time, even at low temperatures.

Shipping Containers: Glass bottles (1, 2, and 5 lb.); tin cans (10, 20, and 50 lb.)

Uses: Medicine.

SODIUM SILICATE (Water glass) Na_2SiO_3

A homogeneous solution, free from iron and sodium sulfide.

Soluble in water and alkalis; insoluble in alcohol and acids.

Grades: 40° Bé.; 42° Bé.

Shipping Containers: Barrels (50 gal.); iron drums (50 and 100 gal.); tank cars (5,000 gal.).

Uses: Adhesive in the manufacture of corrugated cardboard, mailing tubes, veneered wood products, etc., fireproofing fabrics; greaseproofing paper containers, preservative for eggs; waterproofing walls; cementing stones, pipe insulation, etc.; refining cottonseed oil; binder in the manufacture of abrasive wheels and stones; in hydraulic and acidproof mortars.

ZINC OXIDE (Chinese white; Zinc white) ZnO

Newport zinc oxide is of a good technical quality, and contains a minimum amount of zinc carbonate.

Specific gravity 5.50 5.85.

Grades: Technical.

Shipping Containers: Wooden kegs (50 and 100 lb.).

Uses: Paint pigment; rubber industry; production of zinc salts; manufacture of lithopone; smelting for zinc metal.

ZINC CHLORIDE

Grade: Solution.

Shipping Containers: Barrels (50 gal.); iron drums (50 and 100 gal.); tank cars (5,000 gal.).

Uses: Wood Preservative.

PACIFIC COAST BORAX COMPANY

100 William Street

CHICAGO, ILL. NEW YORK, N. Y. SAN FRANCISCO, CALIF.

Cable Address: Boracic

PRODUCTS

- Ammonium Borate
- Borate of Manganese
- Borax, Calcined
- Borax Soap Chips
- Borax, Fused
- Borax, Refined
- Borax Soap
- Borax, U. S. P.
- Boric Acid, Anhydrous
- Boric Acid, U. S. P.
- Boric Acid, U. S. P. Granulated
- Boric (Boracic) Acid, Refined
- Muriate of Potash

REFINED BORAX

Crystal
Granulated
Powdered

This product is guaranteed 99½% pure, and is suitable for the manufacture of enameled ware, glass, bath tubs, pottery, gloss starch, leather and dyes; also for preserving food, such as hams and bacon, etc , for the British Government

BORAX, U. S. P.

Crystal
Granulated
Powdered

This grade of Borax suitable for all pharmaceutical and medical purposes

FUSED BORAX

This product is also known as Borax Glass and Anhydrous Borax It is used in crystal, granulated and powdered form as a flux in refining refractory ores, in mineralogical determinations, also for brazing brass tubing.

BORIC ACID, ANHYDROUS

Used as a flux and is also known as boric acid glass.

AMMONIUM BORATE

Powdered

MURIATE OF POTASH

For fertilizing purposes.

CALCINED BORAX

This product is used as a flux

BORATE OF MANGANESE

A dryer for inks, varnishes, paints, etc.

REFINED BORIC (BORACIC) ACID

Crystal
Granulated
Powdered

This product is 99½% to 100% pure H_3BO_3 It is used for making glass and pottery ware, brazing tubing for automobiles, and is also allowed to be used as a preservative for codfish

BORIC ACID, U. S. P.

Crystal
Granulated
Impalpable.
Powdered

For pharmaceutical use where a product free from borax, chlorides, sulphates, heavy metals, etc , is required The granulated form is advocated when a solution is desired. It is largely used to make efficient eye lotions.

GRANULATED BORIC ACID, U. S. P.

Is a new form of Boric Acid which will dissolve more readily than any form hitherto introduced The granules being porous dissolve almost instantly, making a solution in the shortest time possible

BORAX SOAP

An excellent soap containing Borax.

BORAX SOAP CHIPS

Contains 30% of Borax, which makes it an excellent cleanser.

PRICES SUBMITTED ON APPLICATION

PALMER LIME AND CEMENT COMPANY

High Calcium and Magnesium Lime

103 Park Avenue, NEW YORK, N. Y.

Cable Address
"PALMERLIME", New York

PRODUCTS

High Calcium Lump Lime and High Calcium Hydrate of special analysis are manufactured for special purposes.

SERVICE

We operate six large High Calcium plants in Pennsylvania, our Magnesium plant is located at Dover Plains, N. Y. No other Lime manufacturer has facilities equal to these.

HIGH CALCIUM, LIME

Two regular grades of Lump Lime and Hydrate Lime are manufactured.

ANALYSIS

Lump Lime (Quick Lime)

	Special	No 1
CaO.	96 98%	92 95%
Mg. under	3%	5 3%
Insoluble under.	2%	3-2%

Hydrated Lime

	Special	No. 1
CaO.	72 40%	70 20%
Mg	3 10%	6 30%
Insoluble	1 84%	2 50%
Loss on Ignition	22 16%	21 00%

TRAFFIC DEPARTMENT

We maintain a most efficient Traffic Department which is always at the service of our customers.

MAGNESIUM LIME

Regular grades of Lump Lime and Hydrated Lime are manufactured.

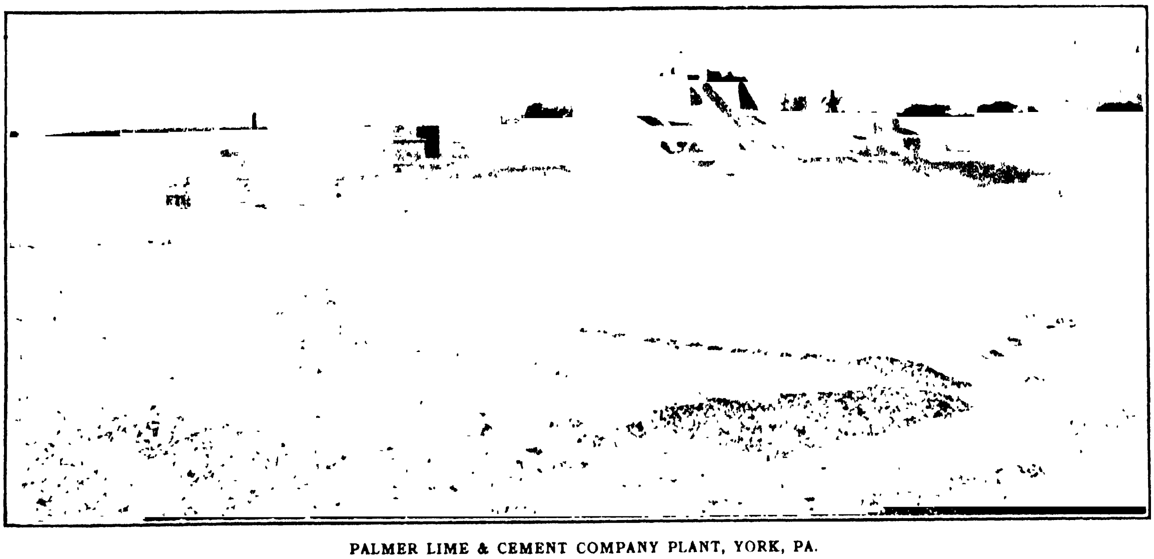
ANALYSIS

Lump Lime (Quick Lime)

CaO	57 00%
Mg	39 16%
Insoluble.	2 14%

Hydrated Lime

CaO.	45 85%
Mg.	31 88%
Insoluble	1 06%
Loss on Ignition.	17 55%



PALMER LIME & CEMENT COMPANY PLANT, YORK, PA.
The most modern High Calcium Lime Plant in the United States

THE PEERLESS WHITE LIME COMPANY

PLANT AND QUARRIES

STE. GENEVIEVE COUNTY, MO.

SALES AGENT

HUNKINS-WILLIS LIME & CEMENT CO.
902 Century Building
ST. LOUIS, MO.

PRODUCTS

Special Chemical High Calcium Lump Lime.

Special Chemical High Calcium Hydrated Lime, Extremely Fine Powder.

Limestone for Chemical Purposes, Ground or Lump.

PEERLESS WHITE LIME

Peerless White Lime, a special chemical lime, is of so high a lime (CaO) content that it is equalled by few and excelled by no other lime on the market It can not be surpassed for purity and whiteness Peerless White Lime runs uniform in quality, composition and purity at all times

All Peerless White Lime is forked removing all the finer particles, thus insuring the shipment of nothing but fresh lump lime to our customers This means that purchasers of Peerless White Lime receive more lime per ton than when kiln run lime is used

ANALYSIS

Calcium Oxide	98.00	per cent
Iron Oxide	0.02	" "
Alumina	0.30	" "
Magnesia	0.45	" "
Silica	0.44	" "

USES

- Production of
  - Bleaching Powder
  - Calcium Carbide
  - Calcium Carbonate, Precipitated
  - Coke-oven By-Products
  - Phenol
  - Potassium Cyanide
- Tanning Industry
  - Depilatory
- Manufacture of
  - Acids
  - Aluminum
  - Brass
  - Electric Furnace Flux
  - Glass
  - Glue
  - Iron Blast-Furnace Flux
  - Paper
  - Rubber
  - Smelter Flux
  - Soap
  - Steel
  - Water Paints
- Recovery of
  - Copper from Smelter Chimney Dust
  - Gold
  - Potash
- Refining
  - Salt
- Purification of
  - Steel
  - Water
- Metal Pickling
- Detinning

SHIPPING CONTAINERS

We use the highest grade of lime cooperage obtainable, with two wire hoops per barrel, making a tight and secure package, preventing premature slaking.

SPECIAL CONTAINERS

We use our patent paper-lined barrel, when desired, in shipping lump lime in barrels to prevent air-slacking. Lime in this package remains fresh without air-slacking indefinitely.

SHIPMENTS

On account of its high lime (CaO) content, we believe that Peerless White Lime is shipped to more distant territory than any other lump lime produced in the United States. We are shipping regularly to large manufacturing plants in New York in the East and Oregon in the West, from Canada to New Orleans.

SAMPLES

Requests for samples will be promptly honored, with strongest possible assurance that carloads shipped subsequently will equal the sample in all respects.

PENNSYLVANIA SALT MANUFACTURING COMPANY

(Incorporated 1850)

High Grade Heavy Chemicals

GENERAL OFFICES
Widener Building, PHILADELPHIA, PA., U. S. A.

WORKS
NATRONA, PA. PHILADELPHIA, PA. WYANDOTTE, MICH.

PRODUCTS

ACIDS
- Fuming Sulphuric (Oleum)
- Sulphuric (all strengths)
- Muriatic
- Mixed
- Nitric
- Acetic
- Glacial Acetic

ALUMS
- Ammonia Alum
- Lump Alum
- Ground Alum
- Powdered Alum
- Filter Alum

ALUMINA
- Hydrate
- Calcined

SULPHATE OF ALUMINA
- "Natrona" Porous (Iron free)
- "Natrona" Concentrated (Iron free)
- Excelsior (Commercial)

SODA PRODUCTS
- Bicarbonate of Soda
- Sal Soda
- Sulphate of Soda (Salt Cake)
- Bisulphate of Soda (Nitre Cake)
- Caustic Soda 60%, 74%, and 76% (electrolytic)

LYE
- Lewis Lye (High Test)
- Saponifier
- Greenwich Lye
- American Lye

CHLORINE PRODUCTS
- Bleaching Powder
- Liquid Chlorine
- Chlorine Gas
- Chlorinated Lime

HYDROGEN GAS

OTHER HEAVY CHEMICALS
- Purple Ore
- Nodulized Iron Ore (for low phosphorous Pig Iron)
- Natrona Red Ore (for Gas Purifying)
- Mineralite Sponge Oxide (ready for Gas Purifying)
- Copperas
- Sulphate of Lead
- Chloride of Alumina

SOLE IMPORTERS OF
GREENLAND KRYOLITH

IMPORTERS OF
- Rio Tinto Pyrites
- Bauxite
- Nitrate of Soda

REFINERS OF
- Copper
- Gold
- Silver

CHARLES PFIZER & CO., INC.

Established 1849

Manufacturing Chemists

NEW YORK, N. Y.

HOME OFFICE
81 Maiden Lane, New York N. Y

Cable Address
"PFIZER," New York

WESTERN SALES OFFICE
180 North Market St., Chicago, Ill

PRODUCTS

U. S. P. Chemicals for medicinal use, also a general line of Chemicals for Blue Print, Photographic, and other technical purposes.

- **Citric Acid** 99½-100%
  - Crystals
  - Powdered
  - Granulated
- **Tartaric Acid** 99½-100%
  - Crystals
  - Powdered
  - Granulated
- **Cream of Tartar** 99½-100%
  - Crystals
  - Powdered
- **Rochelle Salt** 99½-100%
  - Crystals
  - Powdered
- **Seidlitz Mixture**
- **Borax Refined** 99½-100%
  - Crystals
  - Powdered
  - Granulated
- **Boric Acid** 99½-100%
  - Crystals
  - Powdered
  - Granulated
- Camphor Refined
- Camphor Refined Powdered
- Bismuth Subnitrate
- **Bismuth Subcarbonate**
- **Bismuth Subgallate**
- **Bismuth Subsalicylate**
- **Bismuth Oxychloride**
- **Potassium Citrate**
- **Sodium Citrate**
- **Chloroform**
- **Tannin**
- **Calomel** (Mild Mercurous Chloride)
- **Red Precipitate** (Red Mercuric Oxide)
- **White Precipitate** (Ammoniated Mercury)
- **Corrosive Sublimate** (Corrosive Mercuric Chloride)
- **Strychnine and Salts thereof**
- **Sodium Salicylate**
- **Tartar Emetic** (Antimony and Potassium Tartrate)
- **Iron and Ammonium Citrate, U. S. P.**
- **Iron and Ammonium Citrate Green Scales**
- **Iron Citrate U. S. P. 8th Revision**
- **Ferric Ammonium Oxalate**
- **Ferric Potassium Oxalate**
- **Ferric Sodium Oxalate**
- **Ferric Oxalate Scales**
- **Potassium Iodide**
  - Crystals
  - Granulated
- **Iodoform Powdered**
- **Iodine Resublimed**
- **Ammonium Iodide**
- **Sodium Iodide**

Works and Laboratories Borough of Brooklyn New York

PHILADELPHIA QUARTZ COMPANY

Specialists in the Manufacture and Uses of

Silicate of Soda

121 SOUTH THIRD STREET, PHILADELPHIA, PA.

THE PHILADELPHIA QUARTZ COMPANY OF CALIFORNIA
BERKELEY, CALIF.

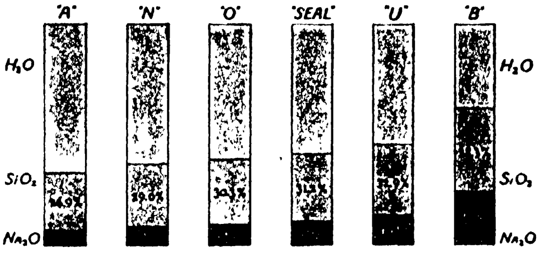
FACTORIES
Chester, Pa.
Rahway, N. J.
Anderson, Ind.
Gardenville, N. Y.
Kansas City, Kans.

PRODUCTS

Silicate of Soda in its various forms and Service in adapting Silicates to their possible uses.

COMPOSITION OF SILICATE OF SODA

Silicate of soda is the general name applied to a group of glass-like materials soluble in water and composed of varying ratios of soda, Na_2O, and silica, SiO_2. The commercial grades may have percentage ratios of alkali to silica between 1 : 1.5 and 1 : 4. An attempt to produce a more alkaline silicate than 1 : 1.5 would lead to the formation of the definite crystalline compound Na_2SiO_3. To increase the silica beyond the ratio of 1 : 4 would yield a product too nearly insoluble to be commercially practicable. The properties of the solutions vary greatly as the compositions change, making possible the adaptation of silicate of soda for a great variety of uses.



COMPOSITION OF TYPICAL BRANDS OF SILICATE OF SODA

GENERAL CHARACTERISTICS

All silicate of soda solutions are colloidal and set from the loss of water to form very hard and strong bonds. All the solutions show an alkaline reaction to litmus and other indicators, and some degree of "alkalinity" is one of the properties of all grades. The various silicates are unaffected by animal, vegetable or mineral oils, fats or greases. They may be mixed freely with neutral fillers, such as clay or silex, and many other substances. Excepting one special brand, all the grades of silicate, if air dried, will dissolve again on continued exposure to water, though the less alkaline grades are not appreciably affected by atmospheric dampness. Heat drives out more of the water from air dried silicates, and red heat softens them. Continued exposure of any silicate to the air results in a reaction with the carbon dioxide of the air.

CHARACTERISTICS OF DIFFERENT BRANDS

Proper adjustment of the composition and concentration of the silicates, along with other special and often delicate processes, produces a wide range of properties. Some brands are quite fluid, others are syrupy, and still others are very thick and viscous. High alkalinity is a special feature in some, as for boiler compounds, low alkalinity in others, as for paper sizing and for acidproof cements. The following list of certain standard uses, and the brands best adapted for each, may be suggestive:

USE	BRAND
Soap Making	"N," "O"
Metal Cleansers	"O"
Paper Sizing	"A," "A Syrup"
Corrugated Paper Board	"S," "N," "O"
Combined Board	"N," "O," "S"
Wall Board	"O"
Coating Paper Board	"N"
Paper Barrels	"N"
Sealing Shipping Containers	"Seal"
Asbestos Air Cell Board	"O"
China Cements	"O," "E," "U"
Box Shooks	"VS" No. 1 or No. 2
Trunk Manufacture	"VS" No. 2
Matching	"VS" No. 1
Abrasive Wheels	"J," "SS Powdered"
Boiler Compounds	"D," "U," "B"
Refractory Cements	"U," "BW," "O," "N"
Acidproof Cements	"S," "A," "O"
Digester Linings	"U," "O"
Refining Cotton seed Oil	"N"
Egg Preserving	"E," "N," "O"
Stainproofing Lumber	"N"
Hardwood Flooring	"N"
Barrel Testing and Sizing	"N"
Fireproofing and Insulating	"N"
Silica Gels	"N"
Silk Weighting	"Star," "E"
Peroxide Cotton Bleaching	"Star"
Boiling off Cotton	"Star"
Pottery Clays and Sagger Mending	"Star," "N"

DEVELOPMENT SERVICE

New uses for silicates, and new silicates for special conditions, are continually being investigated. For many consumers, it has been our privilege to work out special modifications of the silicate used, or special methods of use. Our Chemical and Physical Laboratories are at the service of consumers, and we cordially invite correspondence regarding any problems in which our experience might be of value.

POWERS-WEIGHTMAN-ROSENGARTEN CO.

Founded 1818

Manufacturers of Medicinal and Technical Chemicals

NINTH & PARRISH STREETS, PHILADELPHIA, PA.

BRANCH OFFICES
115 Front St., New York, N. Y.   300 S. Broadway, St. Louis, Mo.
Cable Address "MANPHIL", Philadelphia

PRODUCTS

A general line of medicinal, technical and photographic chemicals.

- **Acetanilide**
- **Acetphenetidine**
- **Acids**
  - Acetic
  - Acetylsalicylic
  - Arsenic
  - Arsenous
  - Benzoic
  - Boric
  - Carbolic
  - Chromic
  - Citric
  - Formic
  - Gallic
  - Hydrobromic
  - Hydrochloric (Muriatic)
  - Hydrofluoric
  - Lactic
  - Molybdic
  - Nitric
  - Oleic
  - Oxalic
  - Phosphoric
  - Pyrogallic
  - Salicylic
  - Stearic
  - Sulphuric (Oil of Vitriol)
  - Tannic
  - Tartaric
- **Alums**
  - Ammonium
  - Chrome
  - Ferric
  - Potassium
- **Aluminum**
  - Sulphate and other Salts
- **Ammonia Water**—16°, 20°, 26° Be
- **Ammonium**
  - Chloride, Sulphate and other Salts.
- **Antimony**
  - Metal, and Antimony Chloride Solution.
- **Arsenic Salts**
  - Arsenates and arsenites.
- **Barium**
  - Carbonate, Chloride, Hydroxide, Sulphate and other Salts.
- **Bismuth**
  - Metal, Nitrate, Subcarbonate, Subgallate, Subnitrate, Subsalicylate and other Salts.
- **Borax**—Fused, Calcined.
- **Bromine**
- **Cadmium**—Metal and Salts.
- **Caffeine**
- **Caffeine Citrated**
- **Calcium**
  - Bromide, Carbonate, Precipitated, Chloride and other Salts.
- **Calomel**
- **Chloroform**
- **Chromium**
  - Chromates, Sulphate and other Salts.
- **Cinchonidine** Sulphate and other Salts.
- **Cinchonine** Sulphate and other Salts.
- **Codeine** Sulphate, Phosphate and other Salts.
- **Collodion**
- **Copper**
  - Metal, Acetate, Sulphate and other Salts.
- **Corrosive Sublimate**
- **Cream of Tartar**
- **Cyanides**
- **Epsom Salt** (Magnesium Sulphate)
- **Ether**
  - For Anesthesia, Concentrated.
  - Priming.
- **Formaldehyde Solution**
- **Glauber's Salt** (Sodium Sulphate)
- **Glycerin**
- **Gold Chloride** and other Salts
- **Hexamethylenetetramine**
- **Hydrogen Dioxide Solution**
- **Iodine Resublimed**
- **Iron**
  - By Hydrogen, Chloride Lumps, Chloride Solution, Nitrate Solution, Subsulphate Solution (Monsel's), Sulphate (Ferrous), and other Salts, and Ammonium Citrate Scales Brown, and Ammonium Citrate Scales Green, and other Scale Preparations.
- **Lead**
  - Acetate, Nitrate and other Salts.
- **Lithium**
  - Bromide, Carbonate, Citrate and other Salts.
- **Lunar Caustic**
- **Magnesium**
  - Carbonate, Oxide, Sulphate and other Salts.
- **Manganese**
  - Dioxide, Sulphate and other Salts.
- **Mercury**
  - Distilled, Redistilled and Salts.
- **Morphine** Sulphate and other Salts.
- **Nickel** Metal, Carbonate and other Salts.
- **Potash Caustic**
- **Potassium**
  - Acetate, Bromide, Carbonate, Chlorate, Citrate, Iodide, Nitrate and other Salts.
- **Quinidine** Sulphate and other Salts.
- **Quinine** Sulphate and other Salts.
- **Red Precipitate**
- **Rochelle Salt**
- **Sal Ammoniac**
- **Sal Soda**
- **Sal Tartar**
- **Silver** Nitrate and other Salts.
- **Soda Caustic**
- **Sodium**
  - Acetate, Bromide, Carbonate, Iodide, Phosphate, Sulphate and other Salts.
- **Strontium**
  - Bromide, Carbonate Precipitated, Nitrate and other Salts.
- **Strychnine** Alkaloid, Sulphate and other Salts.
- **Sugar of Lead**
- **Sulphur**
  - Flour, Flowers, Fused, Precipitated, Sublimed, Washed.
- **Tannin**
- **Tartar Emetic**
- **Tin** Protochloride
- **White Precipitate**
- **Zinc**
  - Metal, Chloride, Chloride Solution, Oxide, Stearate, Sulphate and other Salts.

PHILADELPHIA QUARTZ COMPANY

Specialists in the Manufacture and Uses of

Silicate of Soda

121 SOUTH THIRD STREET, PHILADELPHIA, PA.

THE PHILADELPHIA QUARTZ COMPANY OF CALIFORNIA
BERKELEY, CALIF.

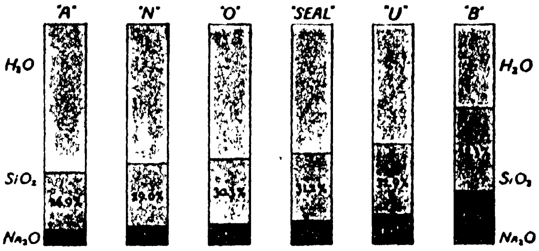
FACTORIES
Chester, Pa
Rahway, N J.
Anderson, Ind
Gardenville, N Y
Kansas City, Kans.

PRODUCTS

Silicate of Soda in its various forms and Service in adapting Silicates to their possible uses.

COMPOSITION OF SILICATE OF SODA

Silicate of soda is the general name applied to a group of glass-like materials soluble in water and composed of varying ratios of soda, Na_2O, and silica, SiO_2. The commercial grades may have percentage ratios of alkali to silica between 1 : 1.5 and 1 : 4. An attempt to produce a more alkaline silicate than 1 : 1 5 would lead to the formation of the definite crystalline compound Na_2SiO_3. To increase the silica beyond the ratio of 1 : 4 would yield a product too nearly insoluble to be commercially practicable. The properties of the solutions vary greatly as the compositions change, making possible the adaptation of silicate of soda for a great variety of uses.



COMPOSITION OF TYPICAL BRANDS OF SILICATE OF SODA

GENERAL CHARACTERISTICS

All silicate of soda solutions are colloidal and set from the loss of water to form very hard and strong bonds. All the solutions show an alkaline reaction to litmus and other indicators, and some degree of "alkalinity" is one of the properties of all grades. The various silicates are unaffected by animal, vegetable or mineral oils, fats or greases. They may be mixed freely with neutral fillers, such as clay or silex, and many other substances. Excepting one special brand, all the grades of silicate, if air dried, will dissolve again on continued exposure to water, though the less alkaline grades are not appreciably affected by atmospheric dampness. Heat drives out more of the water from air dried silicates, and red heat softens them. Continued exposure of any silicate to the air results in a reaction with the carbon dioxide of the air.

CHARACTERISTICS OF DIFFERENT BRANDS

Proper adjustment of the composition and concentration of the silicates, along with other special and often delicate processes, produces a wide range of properties. Some brands are quite fluid, others are syrupy, and still others are very thick and viscous. High alkalinity is a special feature in some, as for boiler compounds, low alkalinity in others, as for paper sizing and for acidproof cements. The following list of certain standard uses, and the brands best adapted for each, may be suggestive:

USE	BRAND
Soap Making	"N," "O"
Metal Cleansers	"G"
Paper Sizing	"A," "A Syrup"
Corrugated Paper Board	"S," "N," "O"
Combined Board	"N," "O," "S"
Wall Board	"O"
Coating Paper Board	"N"
Paper Barrels	"N"
Sealing Shipping Containers	"Seal"
Asbestos Air Cell Board	"O"
China Cements	"O," "E," "U"
Box Shooks	"VS" No 1 or No. 2
Trunk Manufacture	"VS" No 2
Matching	"VS" No 1
Abrasive Wheels	"J," "SS Powdered"
Boiler Compounds	"D," "U," "B"
Refractory Cements	"U," "BW," "O," "N"
Acidproof Cements	"S," "A," "O"
Digester Linings	"U," "O"
Refining Cotton seed Oil	"N"
Egg Preserving	"E," "N," "O"
Stainproofing Lumber	"N"
Hardwood Flooring	"N"
Barrel Testing and Sizing	"N"
Fireproofing and Insulating	"N"
Silica Gels	"N"
Silk Weighting	"Star," "E"
Peroxide Cotton Bleaching	"Star"
Boiling off Cotton	"Star"
Pottery Clays and Sagger Mending	"Star," "N"

DEVELOPMENT SERVICE

New uses for silicates, and new silicates for special conditions, are continually being investigated. For many consumers, it has been our privilege to work out special modifications of the silicate used, or special methods of use. Our Chemical and Physical Laboratories are at the service of consumers, and we cordially invite correspondence regarding any problems in which our experience might be of value.

RHODIA CHEMICAL COMPANY

SUBSIDIARY OF

"SOCIÉTÉ CHIMIQUE DES USINES DU RHONE," FRANCE

Manufacturers of Medicinal, Photographic and Industrial Chemicals

Cable Address
"RHODIA", New York

MAIN OFFICE

89 FULTON STREET, NEW YORK, N. Y.

FACTORIES

New Brunswick, N. J., U. S. A.
St. Fons, Rhone, France

Roussillon, Isere, France
La Plaine, Switzerland

PRODUCTS

Pharmaceuticals

Industrial Chemicals

Photographic Chemicals

PHARMACEUTICALS

Antipyrine (Phenazone, U. S. P.)

Ethyl Chloride, Rhodia

In tubes with automatic stoppers for local and general anesthesia

Piperazine Hydrate

Pyramidon, Rhodia

Resorcinol, U. S. P.

Crystal and powdered

Saccharin Soluble, U. S. P.

Crystal, granular and powdered

Saccharin Insoluble, U. S. P.

INDUSTRIAL CHEMICALS

Benzyl Alcohol, Technical

Cellulose Acetate

For water-proofing and fire-proofing of tissues, etc., lacquers, varnishes, enameling, non-inflammable celluloid stock, etc.

Coumarin, Rhodia

Dimethyl Sulphate

Ethyl Chloride, Rhodia

In cylinders for refrigeration and technical purposes.

Resorcinol, Technical

PHOTOGRAPHIC CHEMICALS

Hydroquinone

Monomethyl-para-amidophenol Sulphate

Our trade-mark "Rhodol"—same as Metol.

J. L. & D. S. RIKER, INC.

19 CEDAR STREET, NEW YORK, N. Y.

Cable Address
"RIKER", New York

SELLING AGENTS FOR PRODUCTS OF

Niagara Alkali Co., Niagara Falls, N. Y.
North American Chemical Co., Bay City, Mich.
National Electrolytic Co., Niagara Falls, N. Y.
Oldbury Electro Chemical Co., Niagara Falls, N. Y.

PRODUCTS

Barium Chlorate

Kegs,	Gross weight	145 lb.
	Net weight	130 "

Bichromate of Potash

Casks,	Gross weight	760 lb.
	Net weight	700 "

Bichromate of Soda

Casks,	Gross weight	670 lb.
	Net weight	600 "

Bleaching Powder

Drums,	Gross weight	318 lb.
	Net weight	300 "
Also	Drums of	700 "
	Drums of	100 "
	Cans of	10 "

Caustic Potash

Drums,	Gross weight	718 lb.
	Net weight	700 "

Caustic Soda

Drums,	Gross weight	718 lb.
	Net weight	700 "
	Gross weight	120 "
	Net weight	112 "

Chlorate of Potash

Kegs,	Gross weight	125 lb.
	Net weight	112 "

Chlorate of Soda

Kegs,	Gross weight	125 lb.
	Net weight	112 "

Chrome Alum

Casks,	Gross weight	570 lb.
	Net weight	500 "

Formaldehyde 40% Vol.

Casks,	Gross weight	530 lb.
	Net weight	450 "

Oxalic Acid

Casks,	Gross weight	320 lb.
	Net weight	300 "

Red Phosphorus

Cases,	Gross weight	175 lb.
	Net weight	110 "

Sesquisulfide of Phosphorus

Cases,	Gross weight	150 lb.
	Net weight	105 "

Yellow Stick Phosphorus

Cases,	Gross weight	200 lb.
	Net weight	110 "

SPECIALTIES

Paraformaldehyde

Hexamethylenetetramine

Chrome Sulphate

Weights and measurements of Export Packages will be given on application.

ROBESON PROCESS COMPANY

200 Fifth Avenue, NEW YORK, N. Y.

OPERATING PLANTS

AU SABLE FORKS, N. Y. COVINGTON, VA.

PRODUCT

SPRUCE EXTRACT

MANUFACTURE

Robeson Spruce Extract has been manufactured by this company for over ten years. The process is under constant supervision of experienced chemists. The product is manufactured under patents owned and controlled by this company and we do not license any other manufacturer to use them.

PURITY

All impurities, which are detrimental to leather are removed during our process and we ship extract made especially for the tanning trade.

UNIFORMITY

As both our plants use the same process and are under the same supervision, our product is always uniform.

SHIPMENT

We make shipments in tank-cars where the plants are equipped with suitable storage tanks, it being much more economical to handle the material in this way. We also make shipments in barrels.

Our Covington plant is well equipped to take care of the Southern, Cental and Western trade.

Our Ausable plant takes care of our Northern and Canadian trade.

We own and operate our own tank-car line, which assures prompt shipment in cars properly equipped to handle tanning material.

USES

Robeson Spruce Extract has been the recognized standard for many years in the largest tanneries in the United States and Canada on account of its adaptable quality.

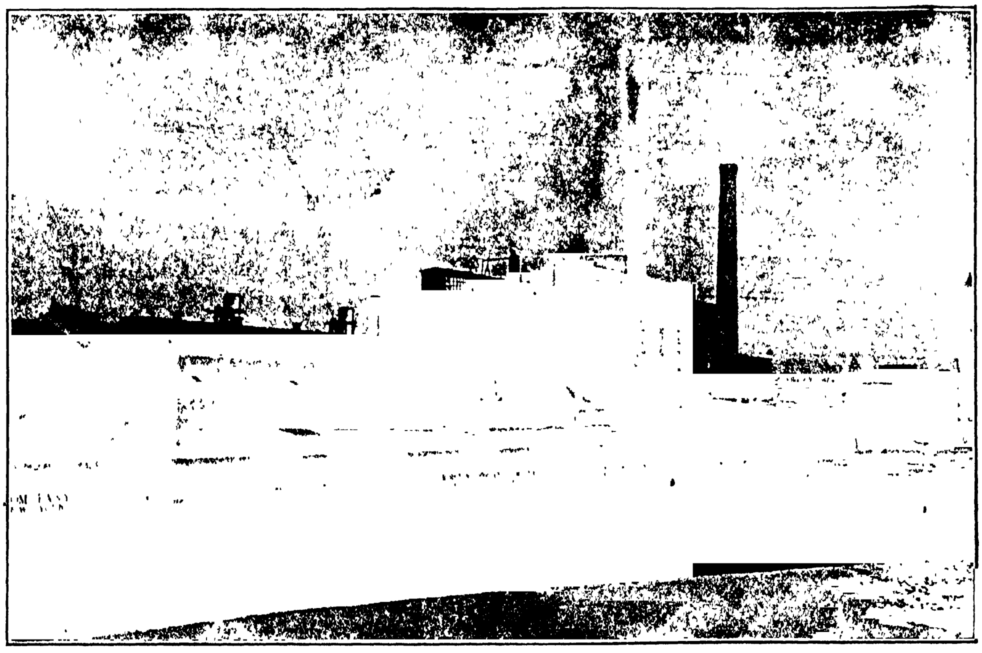
It makes weight, improves color, and blends perfectly with all standard tanning materials.

Robeson Spruce Extract is adaptable for tanning sole, heavy upper, and harness leather, as well as pigskin and other skins and hides.

It is being successfully employed by the following methods:

For sole leather: In the extract drums, tempering vats, dry dipping and in the oil wheels.

For heavy upper leather: For retanning sides and splits.



SOUTHERN PLANT, COVINGTON, VA.

THE ROSSVILLE COMPANY

Alcohol for Every Purpose

LAWRENCEBURG, INDIANA

STOCKS IN

New York	Philadelphia	Boston	Cleveland	Chicago
Newark	Pittsburgh	Buffalo	Detroit	St Louis

PRODUCTS

- **Ethyl Alcohol**
  - Absolute
  - Cologne Spirits
  - Perfumers' Spirit
  - Special Grades for Special Uses
  - U. S. Government Specifications
  - U. S. Pharmacopeia Grade
- **Denatured Alcohol**
  - Completely Denatured
  - Specially Denatured
- **Fusel Oil (Amyl Alcohol)**

ETHYL ALCOHOL

We produce all the standard grades of Ethyl Alcohol, and guarantee them to meet fully the specifications laid down. Special grades for special purposes can be prepared at short notice.

DENATURED ALCOHOL

Our Denatured Alcohols comply in every respect with the regulations of the U. S Bureau of Internal Revenue. We are at all times prepared to furnish alcohol either completely or specially denatured in accordance with any of the permitted formulas

FUSEL OIL

All grades: Crude Fusel Oil, Refined Fusel Oil, Amyl Alcohol.

MANUFACTURING FACILITIES

Our plant is thoroughly modern in all respects The equipment and personnel are efficient and well organized, insuring uniformity of products as well as quality production. The capacity is such that quantity production can be always maintained.

STOCKS

Ample stocks of all of our products are at all times maintained at our works at Lawrenceburg, Ind, as well as at Boston, Buffalo, Chicago, Cleveland, Detroit, Newark, New York, Philadelphia, Pittsburgh, and St Louis Prompt shipments will be made from the nearest warehouse

CONTAINERS

We ship in clean wooden barrels and steel drums of either fifty-five or one hundred and ten gallon capacity Tank-car shipments of from 5,000 to 10,000 gallons can also be taken care of

RESEARCH

The Rossville Research Laboratory is an integral part of our organization Its facilities to the fullest extent and in all respects are at the disposal of our customers.

SERVICE

Our Legal and Engineering Staffs are fully prepared to interpret the government regulations, to assist in the preparation of necessary permits, advise as to the proper grade of Alcohol required for any specific use, and to render any other assistance required.

QUALITY

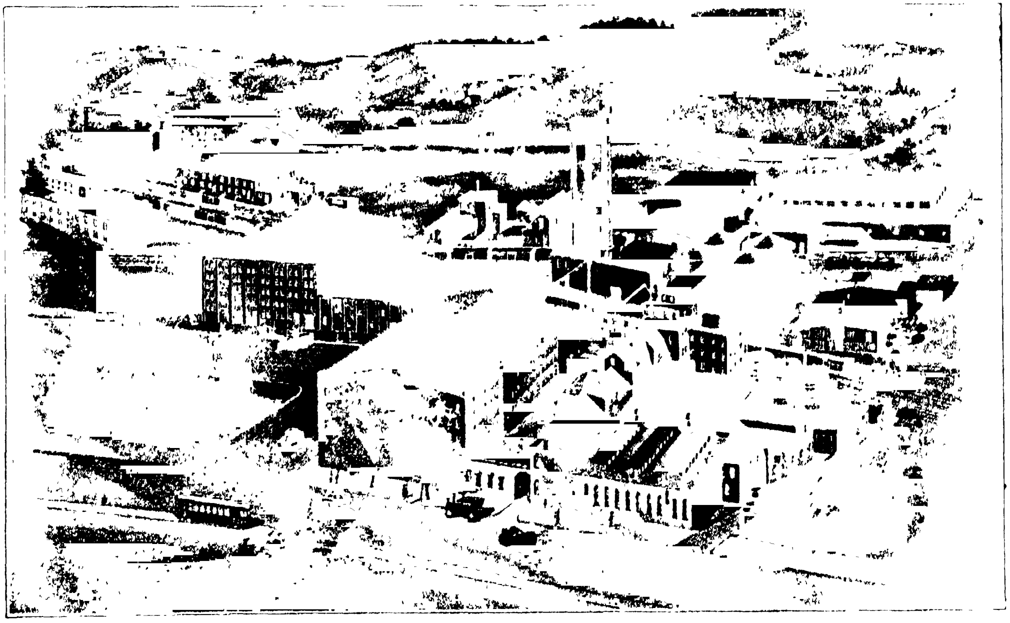
We have set as our standard the highest possible quality that can be produced This will be constantly maintained for all of our products in every shipment.

USES

We are prepared to do our part in the development of an All-American chemical industry. All of our facilities, knowledge and experience is available for the development of existing or new uses of any of our products.

INQUIRIES

All inquiries should be addressed to our general offices at Lawrenceburg, Indiana



THE ROSSVILLE COMPANY, LAWRENCEBURG, IND.

THE ROESSLER & HASSLACHER CHEMICAL COMPANY

Manufacturing Chemists and Manufacturers' Agents

709-717 SIXTH AVENUE, NEW YORK, N. Y.

SALES OFFICES

Boston, 40 Central Street
Chicago, 589 E. Illinois Street
Cincinnati, 518 Union Central Bldg
Cleveland, 1740 E. 12th Street
Kansas City, 2618 Guinotte Ave
New Orleans, 613 Canal Bank Bldg.
Philadelphia, 860 Drexel Bldg
Pittsburgh, 407 Fulton Bldg
San Francisco, 625 Market Street

WORKS

Perth Amboy, N. J.
St. Albans, W. Va.
Niagara Electro Chemical Co., Niagara Falls, N. Y.
Pacific R. & H. Chemical Corp., Los Angeles, Cal.

Cable Address "JIGDA", New York

PRODUCTS

Chemicals for the Industries and Arts, particularly for Electroplating, the Tanning and Textile Industries. Solvents, Peroxides, Perborates, Pharmaceuticals, and Chlorinated Hydrocarbons.

Electroplating Chemicals

- Cyanegg (96-98% Sodium cyanide)
- Cyanides
  - Copper
  - Lead
  - Nickel
  - Silver
  - Zinc
- "Trisalyts"
  - Cadmium
  - Copper
  - Gold
  - Silver
  - Zinc
- Nickel Chloride
- Nickel Salts
  - Single (Nickel sulfate)
  - Double (Nickel-ammonium sulfate)
- Platinum Salts
- "Platin-Nig"
- Polysulfide (of soda)
- Platinum Chloride
- Sodium Sulfocyanide

Ceramic Materials

For pottery, glass, clay and enameled-ware industries

- Ceramic Chemicals, Minerals and Oxides
  - Chemicals
    - Arsenic, White
    - Barytes
    - Boric Acid
    - Borax
    - Cadmium, Metal
    - Cadmium Sulfide
    - Cobalt Salts
    - Glass, Powdered
    - Lead, White and Red
    - Leukonin
    - Potassium Carbonate
    - Potassium Nitrate
    - Powdered Blue
    - Selenium
    - Sodium Carbonate
    - Sodium Nitrate
    - "Terrar"
  - Minerals
    - Antimony, Needle
    - Clays
    - Feldspar
    - Flint
    - Fluorspar
    - Kalkspar
    - Cryolite
    - Marble dust
    - Rutile
    - Whiting
  - Oxides
    - Aluminum
    - Antimony
    - Chromium
    - Cobalt
    - Copper
    - Iron
    - Lead
    - Manganese
    - Nickel
    - Tin
    - Uranium
    - Zinc
    - Zirconium
- Ceramic Decorations
  - Liquid Bright Gold, Silver and Platinum preparations.
  - Colors
    - Overglaze colors
    - Underglaze colors
    - Glass colors
    - Majolica colors
    - Liquid luster colors
    - Fluxes
  - Enamels

Rare Metals

- Platinum
- Iridium
- Other Platinum group metals
- Palladium

Solvents, Cleaners, etc.

- Chloroform, U.S.P.
- Methanol
- Acetone, U.S.P. and tech
- Methyl Acetone

Non-inflammable Solvents

- Carbon Tetrachloride
- Chlorine Derivatives
  - Tetrachloroethane
  - Pentachloroethane
  - Dichloroethylene
  - Trichloroethylene
  - Perchloroethylene

Fumigators, Germicides, Fungicides

- Formaldehyde Paste,
  - Formaldehyde solution (40% volume)
- Paraformaldehyde

Insecticides

- For flour-mills, green-houses, citrus trees, etc.
- Cyanegg (96-98% Sodium cyanide)
- "Hydro-Cy" (Hydrocyanic acid, Liquid)
- Naphthalene (Moth repellant)

Bleaching Agents

- "Albone" (25 to 30% by volume H_2O_2)
- Bleaching Powder (Chloride of Lime)
- "Solozone" (Sodium Peroxide)
- Chlorine (liquid)
- Potassium Permanganate
- Hydrogen Peroxide
- Sodium Perborate

Oxidizing Agents

- (See also Bleaching Agents)
- Manganese Dioxide
- Potassium Chlorate
- "Oxone"
- Sodium Chlorate

Dyeing Chemicals, etc.

- Sodium Acetate
- Sodium Phosphate
- Antimony Salts (65%) (Tartar Emetic substitute)
- Aluminum Sulfate
- Glauber's Salt, Anhydrous, Calcined and Crystals
- Sodium Bichromate
- Sodium Prussiate, Yellow
- Potassium Bichromate
- Potassium Prussiate, Red and Yellow
- Formic Acid (90%)
- Vanadium Oxide and Salts.

Refrigeration Compounds

- Ammonia, Anhydrous
- Methyl Chloride
- Calcium Chloride
- Ammonia, Aqua
- Ethyl Chloride
- Sulfur Dioxide

Tanning Chemicals

- Arsenic, Red
- Chrome Alum
- Lactic Acid
- Sodium Sulfide
- Sodium Bichromate
- Potassium Bichromate
- Splate (Barium chloride)

Continued on Next Page

Rubber Chemicals

Pigments
Antimony Sulfuret,
Golden, Crimson,
Vermilion
Alumina Earth
Magnesia (heavy)
Sulfur
Iron Oxides
Magnesium Carbonate (light)
Whiting
Zinc Oxide

Accelerators
Hexamethylenetetramine,
Technical
Aldehyde Ammonia
Formaldehyde Aniline
Thiocarbanilide

Paint and Color Chemicals

Antimony Sulfate
Arsenic, White
Barium Chloride
Copperas
Iron Oxide
Potassium Prussiate
Sodium Prussiate
Zinc Oxide
Copper Cyanide (Marine anti-fouling paint)
Zinc Cyanide (Anti-rust paint)
Whiting

Fireworks Chemicals

Barium and Strontium Nitrates, Antimony Needle
Sodium Chlorate, Potassium Chlorate

Soap-making Chemicals

Potash, Caustic
Soda, Caustic
Stearic Acid
Potassium Carbonate
Sodium Carbonate

Hydrogenation Chemicals

Nickel Formate
Formic Acid
Nickel Oxide
"Hydrone"

Pharmaceuticals, U.S.P.
(See also Bleaching and Oxidizing Agents)

Peroxides
Calcium
Magnesium
Zinc Peroxide Soap
Strontium
Zinc, etc

Perborates
Calcium
Magnesium
Strontium
Zinc, etc

Acetanilide, Crystal and Powder
Chloroform
Caffeine
Epsom Salt
Hexamethylenetetramine
Iron (by Hydrogen)
Lithium Salts,
Benzoate, Carbonate, Citrate, etc

Other Chemicals for the Industries and Arts

Acid, Phosphoric, U S P. and Tech. (For soft drinks)
Acid, Oxalic (For bleaching, dyeing and tanning)
Iron Chlorides (For dyeing, chlorination of ores, oxidizing and pharmaceutics)
R. & H. Case-hardener (For tempering steel)
Sodium Carbonate, Potassium Carbonate
(Calcined and hydrated)
(For dyeing, bleaching, soap and glass manufacturing, and tanning)
Sal Ammoniac, White and Gray
(For galvanizing and primary cells)
Sodium, Metallic (As reducing agent)
Sodium Sulfite
"Hydrone" (For generating hydrogen gas)
Lead Acetate (For desulfurizing)
Manganese Sulfate (For dyeing, in ceramics, and as drier)
Potassium Oxalate and Bioxalate
Sodium Bisulfite (For paper manufacturing and dyeing)
Trisodium Phosphate (As boiler-compound and water-softener)
Zinc, Sheets, Discs and Dust.
(For precipitation of gold and silver in cyanide process)
Zinc Chloride (For preservation of wood and animal material; dyeing; fire-proofing, etc.)
Zinc Sulfate (For dyeing, as disinfectant, astringent and drier).

SODIUM CYANIDE

History and Use—Originally Cyanide was used principally for electroplating, photography, and as an aid in the amalgamation process for the recovery of precious metals from ores. The consumption in the United States was not more than several hundred tons annually. With the introduction of the MacArthur-Forrest extraction process in the Transvaal in 1891, for the recovery of gold from tailings by the use of dilute cyanide solutions, now also applied to silver sulfide ores, the world's consumption of Cyanide has increased to many thousand tons per annum. It is estimated that 25% of the world's production of gold is now extracted with cyanide.

In 1890 The Roessler & Hasslacher Chemical Company began to manufacture Potassium Cyanide at its works, Perth Amboy, N. J. Potassium Cyanide 98-99% KCN was first made by the old method of fusing Potassium Ferrocyanide; later Cyanide with addition of Sodium was made guaranteed to test equivalent to 98-99% KCN.

In 1902 the manufacture of synthetic Sodium Cyanide by the Castner process was taken up to replace the more expensive Potash Salts. At first a product of only 90% purity was obtained which has now been improved to the standard of 96-98% NaCN.

In 1916 the old method of designating the Sodium Cyanide in terms of Potassium Cyanide was dropped, though this designation of KCN equivalent to 128-130% still prevails in foreign countries. The present designation based on Sodium Cyanide content in comparison with the old method follows:

COMPARATIVE CYANIDE VALUES
(Theoretical)

NaCN (100%)		KCN (100%)	
Cyanogen (CN)	53.075%	Cyanogen (CN)	39.953%
Sodium (Na)	46.925%	Potassium (K)	60.047%
	100.00%		100.00%
1 lb NaCN = 1⅓ lbs KCN		1 lb KCN = ¾ lb NaCN	

Old Designation		Cyanogen Content for both	New Designation	
Sodium Cyanide	128-130%	51-52%	Sodium Cyanide	96-98%
Cyanide Chloride Mixture	98-99%	39-40%	Cyanide Chloride Mixture	73-76%

The Roessler & Hasslacher Chemical Company is today the only manufacturer of Sodium Cyanide in the United States, to-wit:

Cyanegg Standard high grade Sodium Cyanide 96-98% NaCN with 51-52% cyanogen content. This is a clean white salt, cast in the shape of eggs, weighing uniformly about an ounce. It is packed in air-tight galvanized iron drums, holding net 100 and 200 lbs. (gross weight 110 and 220 lbs., respectively).

Cyanogran 96-98% NaCN with 51-52% cyanogen content, in granular form.

Cyanide-Chloride Mixture 73-76% NaCN with 39-40% cyanogen content, equivalent to 98-100% KCN.

Applicability—The Cyanide process is especially applicable to low-grade gold ores in which the gold occurs in a finely divided free or metallic state, or refractory ores to which the amalgamation process is not applicable, and to the more common, chloride and sub-sulfide, silver ores.

SECURITY CEMENT AND LIME COMPANY

SECURITY CEMENT AND LIME COMPANY
SECURITY
PORTLAND CEMENT
SECURITY MD

CEMENT PLANT
SECURITY, MD.

Western Maryland and
Baltimore & Ohio Railroads

GENERAL OFFICES

HAGERSTOWN, MARYLAND

SALES OFFICES

Equitable Bldg.
BALTIMORE, MD.

Colorado Bldg.
WASHINGTON, D. C.

SECURITY CEMENT AND LIME CO.
LIME
BERKELEY
PRODUCTS
BERKELEY. W. VA.

LIME PLANT
BERKELEY, W. VA.

Cumberland Valley (Penn.) and
Baltimore & Ohio Railroads

PRODUCTS

Berkeley Lump, Ground and Hydrated Lime.
Security Portland Cement.
Pulverized Limestone, Crushed Stone, Flux Stone.

BERKELEY LUMP LIME

Prepared from pure, high-calcium limestone of exceptional grade, evenly and thoroughly burned in modern, gas-fired kilns. High causticity, low silica content, free from impurities and without core.

BERKELEY GROUND LIME

Fresh burned lime, ground to special sizes; particularly adapted to, and processed for Glass manufacturers. We specialize in 10- and 20-mesh Ground Lime. Shipped in bulk; or in 80-pound paper bags.

SECURITY PORTLAND CEMENT

Standard Product used extensively for 13 years. Annual capacity one million barrels.

PULVERIZED LIMESTONE

For agricultural purposes, as filler in asphalt paving and mixed fertilizer. Three grades of fineness—50%, 65% and 85% through 100-mesh sieve.

BERKELEY HYDRATED LIME

Pure, high-calcium Lime, scientifically hydrated at kiln. Air separated and free from coarse particles, impurities, core and over-burnt Lime; practically 99% will pass a 100-mesh sieve. Tanneries, Paper and Pulp Mills, especially Soda Pulp, and many Chemical plants have substituted Berkeley Hydrated Lime for the older lump limes with marked satisfaction and economy.

CRUSHED STONE

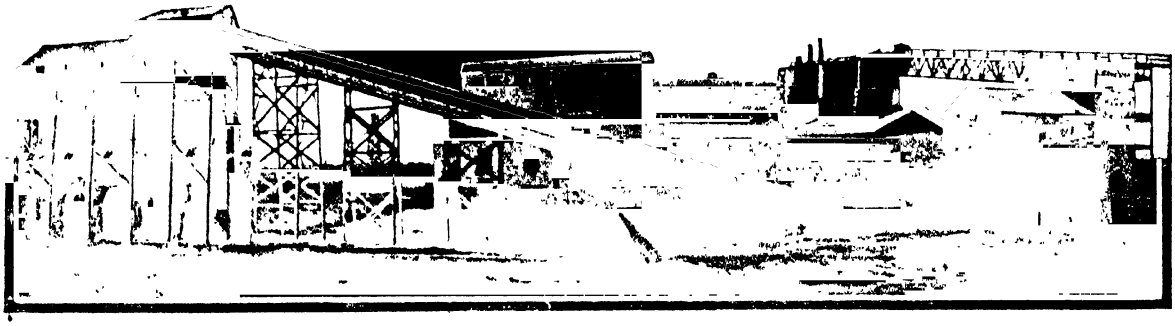
All sizes for Ballast and Concrete road making.

FLUX STONE

Pure, high-calcium Limestone for fluxing purposes.

SERVICE

Every man in our organization is trained in the knowledge that quick shipments and dependable deliveries are vital factors in the industries we serve. Our location on two trunk lines means an adequate car supply with quick rail movement to the Middle Atlantic and Southern States. Rigid chemical control insures constant maintenance of quality — a guarantee to our customers of absolutely trustworthy service.



VIEW SHOWS LIME PLANT AT BERKELEY, W. VA.

E. M. SERGEANT COMPANY

Established Over 40 Years

15 East 26th Street
NEW YORK, N. Y.

Cable Address
"SERGEANTEM", New York

PRODUCTS

The Chemicals listed below are but a partial list of those in which we specialize, due quite naturally to restricted space. We, therefore, solicit inquiries on all Chemicals.

Soda Ash

Caustic Soda, 76%
Solid, ground and flake

Bleaching Powder

Glauber's Salt

Sal Soda

Acetic Acid

Carbonate of Magnesia
In 50-lb. paper lined bags
60-lb. bbls. and 30-lb. kegs

Crystal Copperas
In bulk, bags and bbls.
Product of the Indiana Steel & Wire Company, Muncie, Ind., whose output we control. The quality is very clean and contains a low percentage of moisture.

Bichromate of Soda

Bichromate of Potash

Common Fine Salt
In carloads

Naphthalene
Crude, crystal, flake, balls and tablets

English China Clay

Talc
Imported and Domestic

Oxalic Acid

Barium Chloride

Olive Oil Foots

Red Oil

Bisulphite of Soda
Powdered and Liquid

Hyposulphite of Soda
Regular and Pea Crystals

Yellow Prussiate of Soda

Yellow Prussiate of Potash

Acid Citric

Acid Cresylic

Acid Tartaric

Alum, Ammonia and Potash

Aqua Ammonia

Aniline Oil

Aniline Salt

White Arsenic

Blue Vitriol

Cutch

Gambier

Formaldehyde

Blood Albumen

Acetate of Lead
White and brown

Potash Chlorate

Potash Permanganate

Creosote
In tank steamers

Soda Chlorate

Soda Sulphide
60/62% broken and fused

Sumac
Sicilian

Wood Pulp
Importers and in some cases sole selling agents for Scandinavian manufacturers.

Cork Waste and Cork Wood
A representative in Spain keeps constantly in touch with us regarding market conditions and personally inspects every shipment as to quality and weight and all other important details.

STOCK

For the convenience of customers we keep a stock of some of these products in Warehouses in Philadelphia, Pa., Syracuse, N. Y., Paterson, N. J., Hoboken, N. J., Brooklyn and New York, thus enabling us to give prompt service and to reduce freight expense to the consumer.

INQUIRIES

We invite inquiries from consumers who are particular about their sources of supply and the standing of houses with whom they deal. Each inquiry has the personal attention of an officer of the Company.

CATALOG

Our catalog gives a complete list of the products handled by us. Write for it.

SEMET-SOLVAY COMPANY

Coal Distillates and Allied Synthetic Chemicals

Engineers and Builders of By-Product Coke-Ovens, By-Product Apparatus, and Direct Sulphate Plants

GENERAL SALES OFFICES
SYRACUSE, N. Y.

BRANCH OFFICES
CHICAGO, ILL.
NEW YORK, N. Y.
BOSTON, MASS

PRODUCTS

Coal distillates and allied synthetic chemicals manufactured in the Solvay Plants from the Company's own raw material starting with the mining of the coal. Thus the Company controls the character of the material entering each process which, combined with careful supervision throughout by a skilled technical staff, assures Solvay customers of quality, plus service.

SERVICES

Engineers and Builders of By-Product Coke-Ovens
By-Product Apparatus
Direct Sulphate Plants

COKE

Furnace
Foundry
Domestic
Breeze

AMMONIA PRODUCTS, ETC.

Crude Liquor
Aqua Ammonia
Ammonium Sulphate
Ammonium Bicarbonate
Ammonium Chloride
Sodium Nitrite

LIGHT OIL PRODUCTS

Crude Light Oil
90% Benzol
Pure Benzol
Motor Benzol
Pure Toluol
Solvent Naphtha

TOLUOL DERIVATIVES

Benzyl Chloride
Benzyldehyde
Benzoic Acid
Sodium Benzoate

GAS

City Lighting
Glass Furnaces
Open-Hearth Furnaces
Steam Boilers

TAR PRODUCTS

Coal-Tar
Naphthalene
Protective Paints for Iron and Steel
Concrete Coatings

BENZOL DERIVATIVES

Phenol, Synthetic
Salicylic Acid
Methyl Salicylate
Picric Acid

CYANIDE PRODUCTS

Yellow Prussiate of Soda

THE SEMET-SOLVAY COMPANY

The Semet-Solvay Company was organized in 1895 to manufacture coke and other products from the distillation of coal and to carry on the business which was started in this country in 1892 when The Solvay Process Company brought over from Europe the first plant of by-product coke ovens erected in this country.

From these twelve small ovens, which had a capacity for coking about 50 tons of coal per day, has grown an industry which is now recognized as one of the great agencies in the conservation of our national resources.

The Semet-Solvay Company is the largest individual producer in the world of the products from the distillation of coal, and is now operating plants at:

Ashland, Kentucky
Benwood, West Virginia
Birmingham, Alabama
Buffalo, New York
Chattanooga, Tennessee
Chicago, Illinois
Cleveland, Ohio
Detroit, Michigan
Dunbar, Pennsylvania
Ensley, Alabama
Holt, Alabama
Indianapolis, Indiana
Ironton, Ohio
Navarre, Michigan
Portsmouth, Ohio
Syracuse, New York

These plants are making a notable contribution towards remedying a discreditable waste of the nation's riches. Only six years ago the United States Geological Survey estimated this waste at $80,000,000 annually.

PROGRESS

The first by-product ovens were brought to America primarily for the purpose of producing ammonia for the manufacture of soda by the Solvay process. The Semet-Solvay Company has been closely associated with the Solvay Process Company ever since its incorporation, and has co-operated with it in the development of the chemical industries of the country.

The processes employed in the distillation of coal have developed remarkably in America since the early days, and in some respects are now distinctly in advance of European methods, especially in the size of units and speed of operation. The retort ovens originally brought to this country had a capacity for carbonizing less than 4½ tons of coal per day, while a modern unit can readily carbonize 20 tons of coal per day, with no more labor.

Continued on Next Page

OPERATIONS

The Company produces a large percentage of the coal used in its plants from its own mines, sixteen in number, located mainly in West Virginia and Kentucky, and is the only commercial company in America which carries on the entire operation from the mining of the coal through to the production for sale of the finished products ready for the chemical trade.

Coincident with the growth of this Company have grown the chemical industries of America. The demand for the chemical products obtained in the distillation of coal has developed with the available supply.

For many years this Company was the only producer on an important scale in America of benzol, toluol, xylol and solvent naphtha, which have come into prominent notice of late, as they are the raw materials from which we make many of the high explosives which played such an important part in the great war.

Seventeen years ago the Company began the production from its benzol of synthetic carbolic acid in large quantities and of the highest purity, mainly for conversion into picric acid and ammonium picrate. Since then the Company's chemical products from the distillation of coal have grown to number about 35 articles, as shown in the list given above.

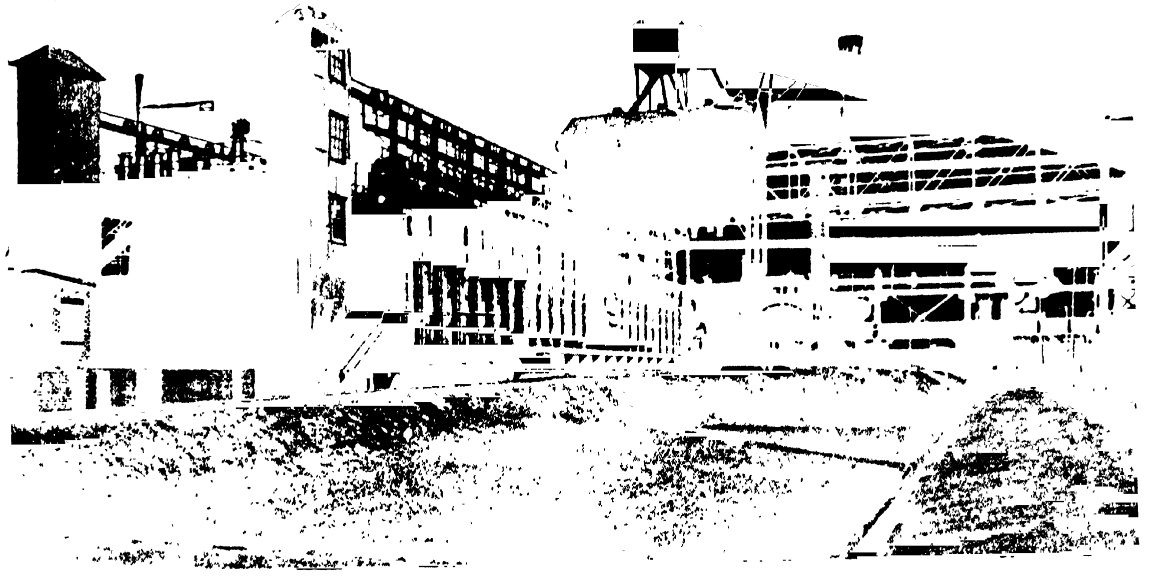
In addition to this, the Company has recently associated itself with the National Aniline & Chemical Company, Incorporated, thereby entering the great field of colors and dyes, which war conditions have shown to play a vital part in the industrial life of a nation. The finished products of the Semet-Solvay Company form the raw materials for the manufacture of these colors and dyes. Therefore, this association forms the connecting link for the production of the most highly finished industrial products all the way up from the raw coal in the ground.

RELIABILITY

For nearly 25 years the Company's constant aim has been to make the name "Solvay" stand for reliability and the highest possible quality of everything put out under its name. The Company's policy has always been that the best advertising is the satisfied customer, and to this end the Company's experts have made themselves familiar with the use to which its products are put, so that each article can be produced of the best quality and in the best form for the purpose required.

CORRESPONDENCE SOLICITED

The Company welcomes correspondence regarding any of its products and will gladly cooperate in suiting them to the needs of its customers. We want you to become acquainted with "Solvay Service." When you need any products from the distillation of coal, insist on those made under the Solvay name and become one of Solvay's satisfied customers.



SEMET-SOLVAY PLANT OF THE CHATTANOOGA (TENN.) COKE AND GAS CO.

THE SHEPHERD CHEMICAL CO.

CINCINNATI, OHIO

EASTERN REPRESENTATIVES
SLOAN & RUSSELL, INC
108 Broadway
New York, N Y

WORKS
Norwood, Ohio

PRODUCTS

- **Cobalt Salts**
- **Driers for Inks, Paints and Varnishes**
- **Lead Peroxide**
- **Manganese Peroxide**
- **Metallic Soaps**
- **Chrome Green Oxide**

COBALT SALTS

We are headquarters for all Cobalt salts and manufacturers of cobalt pigments, glass, ceramic products, varnish driers, etc., may be sure of obtaining high grade products best suited to their particular purposes.

- Acetate
- Arsenate
- Carbonate
- Chloride
- Hydrate
- Nitrate
- Oxalate
- Phosphate
- Sulphate

DRIERS FOR INKS, PAINTS AND VARNISHES

- Aluminum Resinate
- Cobalt Acetate
- Cobalt Hydrate
- Cobalt Ink Drier No. 354
- Cobalt Linoleate, Solid
- Cobalt Linoleate, Paste
- Cobalt Linoleate, Liquid
- Cobalt Resinate, Precipitated
- Cobalt Resinate, Fused
- Cobalt Special Ink Paste
- Cobalt Japan Drier
- Copper Linoleate
- Copper Resinate
- Hardening Powder
- Japan Driers
- Lead Linoleate
- Lead Resinate, Precipitated
- Lead Resinate, Fused
- Manganese Acetate
- Manganese Borate
- Manganese Linoleate
- Manganese Resinate, Precipitated
- Manganese Resinate, Fused
- Manganese Dioxide, Ground
- Manganese Dioxide, Recovered
- Zinc Resinate, Precipitated
- Zinc Resinate, Fused

LEAD PEROXIDE

MANGANESE PEROXIDE

We produce these peroxides in both powder and paste form. Color manufacturers will find these products of the highest quality and extremely reactive.

CHROME GREEN OXIDE

Of highest purity for use in the ceramic industry.

METALLIC SOAPS

- Aluminum Oleate
- Aluminum Palmitate
- Aluminum Stearate
- Calcium Stearate
- Lead Oleate
- Lead Palmitate
- Lead Stearate
- Iron Oleate
- Other Metallic Oleates, Palmitates and Stearates.

OPERATIONS

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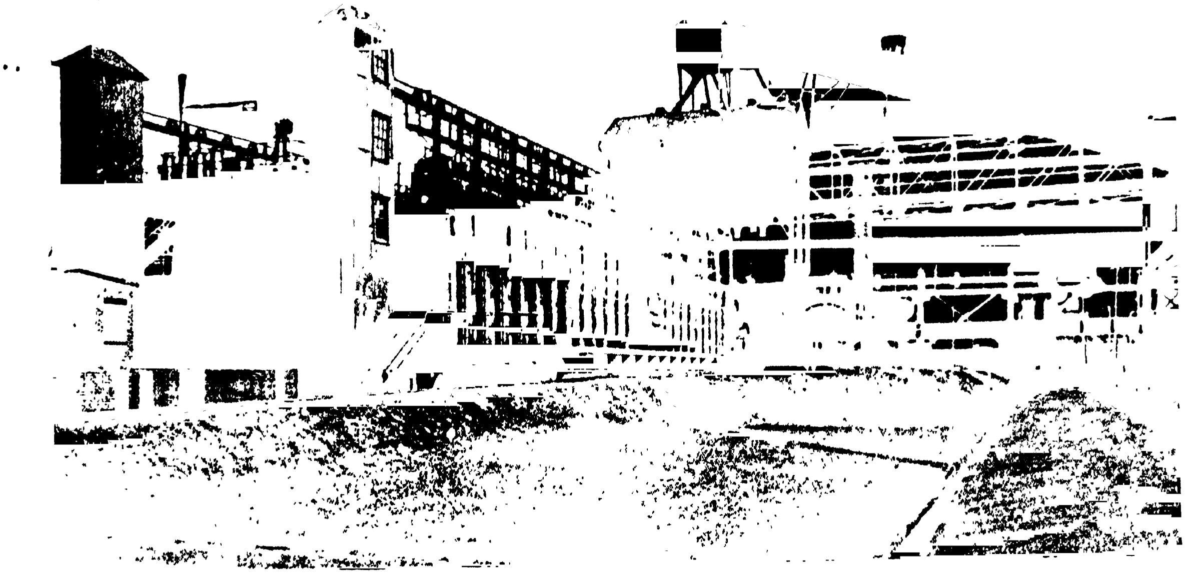


SEMET-SOLVAY PLANT OF THE CHATTANOOGA (TENN.) COKE AND GAS CO.

THE SOLVAY PROCESS COMPANY

Manufacturer of Alkalis

Detroit Mich SYRACUSE, N. Y. Hutchinson Kan

SELLING AGENTS

WING & EVANS, INC.

22 William Street, New York, N Y

BRANCH OFFICES

Detroit Mich
625 Book Building

Boston Mass
89 State Street

Chicago Ill
10 N Dearborn St

PRODUCTS

The Sodium Alkalis in all Commercial Tests and Allied Products.

Soda Ash, dense and ordinary.
Caustic Soda, solid, granular and flake.
Bicarbonate of Soda.
Caustic Ash, 15%, 25%, 36%, 45%.
Modified Soda, so called Neutral Soda.
Snow Flake Crystals, sodium sesquicarbonate.
Crown Filler, paper filler.
Limestone, commercial and agricultural.
Calcium Chloride, solid, granular and flake.
Whiting.
Metal Cleaner, grease remover.

PLANTS

The three plants of The Solvay Process Company are located at points of advantage for the distribution of their products. They are also located near suitable supplies of raw materials.

The Syracuse plant has ample capacity and an ideal location to supply the eastern part of the United States.

The Detroit plant can care for the middle west both as to capacity and distribution facilities.

The rapidly developing west and southwest are adequately provided for at the Hutchinson plant.

Each of these plants is thoroughly modern. Uniform methods of control and operation are maintained at all plants. The general operating and technical staffs at Syracuse working through the local plants staffs insure uniform operation and uniform products.

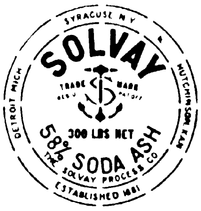
Rigid specifications for all products based on the consumers' needs are in force. All products are inspected and passed on by the laboratories before shipment.

TECHNICAL SERVICE

A staff of trained chemists is maintained to promote the best use of the company's products and to sense the needs of the trade as regards quality or form of alkali demanded.

This Department is available to the consumer for information in regard to the composition, properties and uses of alkalis. It is also available for problems connected with the use of alkali in manufacturing, bleaching, cleansing, water softening, etc., or for analytical service. The Solvay Process Company recommends the purchase of alkali on specifications.

SODA ASH—Na_2CO_3



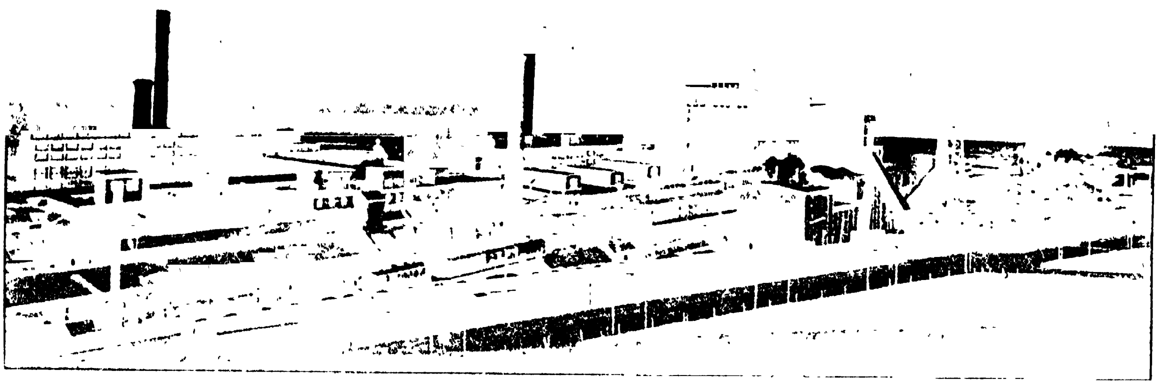
THIS LABEL ON EVERY PACKAGE

Soda Ash is found in commerce in the following grades, all of which are made by The Solvay Process Company.

58% Light and 58% Dense
48% Light and 48% Special

The 58% Ash is the highest grade of Soda Ash manufactured and contains not less than 98.8% sodium carbonate on leaving the plant or 99.17% on a dry sample, not more than 55% salt, and not over .1% insoluble. It is white in color and is of medium fineness.

The distinction between 58% Light (or ordinary) and 58% Dense is merely one of density, the Dense Ash weighing about twice as much as the Ordinary Ash per unit volume.



PLANT OF THE SOLVAY PROCESS CO., SYRACUSE, N. Y.

Continued on Next Page

One liter of 58% Light Ash weighs about 500 grams while one liter of 58% Dense Ash weighs not less than 950 grams

Chemically they are identical and perform the same functions The Dense Ash is used where small bulk is desirable, e g., in glass manufacture

The 48% Ordinary Ash and the 48% Special are reduced with salt (NaCl) and sodium sulphate (Na_2SO_4) respectively Both of these grades contain about 82% sodium carbonate and about 17% salt in the case of the Ordinary and 17% sodium sulphate in the case of the Special They are used for special purposes where a milder form of soda ash is desired

Soda Ash is used in the manufacture of glass, soap, paper, chemicals, drugs, paints, leather, enamel ware, cleansers. It is also used in the textile industries, in dyeing operations, bleaching, water softening, metallurgical operations, bottle and dish washing, refining of vegetable and mineral oils, metal working and prevention of timber mold.

Packages: Soda Ash

58%	Light Soda Ash	Bags	300 lbs	Barrels	300 lbs
58%	Dense " "	Bags	500	"	500 "
48%	Ordinary " "	Bags	300 "		300 "
48%	Special "	Bags	500		

BICARBONATE OF SODA $NaHCO_3$

Bicarbonate of Soda in the pure, white, fine form is the well known Baking Soda. It contains not less than 99.7% sodium bicarbonate, not over .025% —.03% salt and not more than .004 gram per kilo. of iron (Fe_2O_3)

It is used in the manufacture of baking powders, which are used over the civilized world Also, other grades not so highly refined are used for producing carbonic acid for charging waters, in the manufacture of chemicals and drugs, for charging fire extinguishers, and for the prevention of timber mold.

Packages: Bicarbonate of Soda

Barrels 350 to 550 lbs. net, according to grade

CAUSTIC SODA—NaOH

Caustic Soda is manufactured in the following grades

SOLID CAUSTIC—
76%, 74%, 70% Ordinary
70% Special, 60% Ordinary
60% Special
GROUND CAUSTIC –
76%, 74%
FLAKE CAUSTIC—76%

THIS LABEL ON EVERY PACKAGE

Caustic Soda is graded according to the percentage content of actual alkali (Na_2O) in it, 76% being the highest commercial grade.

76% Caustic Soda contains at least 97% sodium hydrate (NaOH), less than 1% sodium carbonate (Na_2CO_3) and less than 75% sodium sulphate (Na_2SO_4)

74% Caustic Soda contains about 94% sodium hydrate (NaOH), approximately 1.5% sodium carbonate (Na_2CO_3), 1.3% sodium sulphate (Na_2SO_4) and 2% salt

70% Ordinary and 70% Special both contain about 90% sodium hydrate (NaOH), 1%–1.5% sodium carbonate, and about 7% salt for the former and 7% sodium sulphate for the latter

60% Ordinary and 60% Special both contain about 77% sodium hydrate (NaOH), 1%–1.5% sodium carbonate, and about 20% salt for the former and 20% sodium sulphate for the latter

The chief uses of Caustic Soda are in the manufacture of soap, paper, lye, chemicals, drugs, and dyes, paints, enamel ware, leather, used also in the textile industries, mercerizing of cotton, manufacture of artificial silk, water softening, bottle washing, vegetable and mineral oil refining, metal working, and in the preparation of cleansers

The Special Caustic Sodas contain amounts of sodium carbonate and sodium sulphate, and are of a softer nature than the ordinary Caustic.

Packages:

Caustic Soda - Solid Drums 675 lbs net.

Ground Caustic is ordinary solid caustic ground for putting up in small packages, for use in cleansing, in batteries, etc

Packages:

Ground—Barrels 550 lbs 575 lbs ; Drums 400 lbs

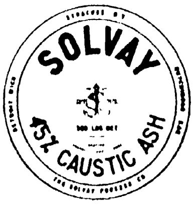
Flaked Caustic—As indicated by its name, flaked Caustic Soda is a product prepared in thin wafer or flake-like form, suitable for all purposes for which ground caustic is used, but possessing physical properties which make it more desirable for handling, and gives it a better appearance.

It is free from dust, which makes it less hydroscopic than ground caustic, and consequently the material is much less likely than the ground caustic to cake when stored. It is furnished only as high test 76% caustic.

Packages- Drums 375 lbs. net.

CAUSTIC ASH

Caustic Ash is a term covering intimate and finely ground mixtures of Soda Ash and Caustic Soda, and is usually graded ac-



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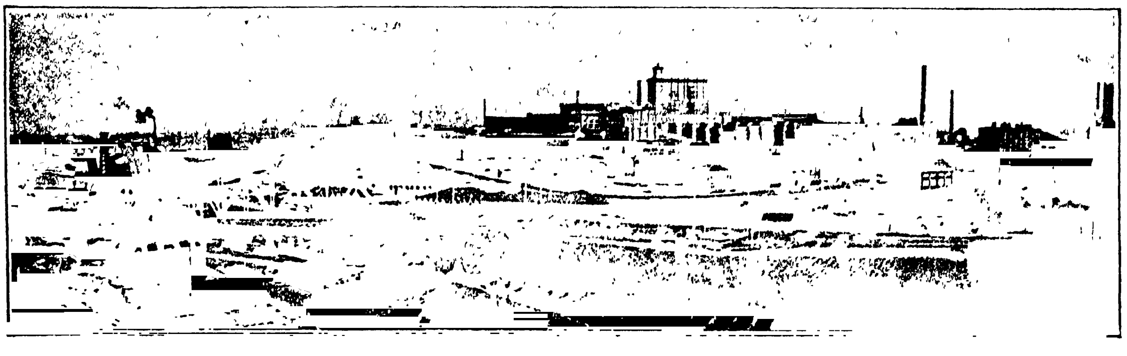


PLANT OF THE SOLVAY PROCESS CO., DETROIT, MICH.

Continued on Next Page

cording to the percentage content of Caustic Soda, i.e., actual sodium hydroxide (NaOH).

We are prepared to make any mixture desired, and have the following grades always in stock:

Caustic Ash of 15%, 25%, 36%, 45% NaOH

15% Caustic Ash contains not less than 15% caustic soda and about 84% sodium carbonate

25% Caustic Ash contains not less than 25% caustic soda and about 74% sodium carbonate

36% Caustic Ash contains not less than 36% caustic soda and about 62% sodium carbonate

45% Caustic Ash contains not less than 45% caustic soda and about 53% sodium carbonate

Caustic Ash is used in many cleansing operations where a strong alkali is needed, as in boiling of cotton, bottle washing and metal cleaning, etc. It is also used for water softening and in the manufacture of leather.

See Special Pamphlets on Metal Cleaning and Water Purification.

MODIFIED SODAS (so-called Neutral Sodas)

Modified Sodas is a term which includes those forms of mild alkali which contain more carbonic acid than the normal sodium carbonate or Soda Ash and less than bicarbonate of soda. These products are sometimes known as "neutral sodas."

The Solvay Process Company manufactures the following specialties in Modified Sodas and is prepared to furnish any other particular combination desired.

THIS LABEL ON EVERY PACKAGE

Snow Flake Crystals, Na_2CO_3, $NaHCO_3$, $2H_2O$ are fine white needle-like crystals, which are very readily soluble in water and are absolutely free from caking in storage. This product is used principally in the textile and laundry industries.

Solvay Laundry Soda is a granular modified soda of the usual form of approximately the composition of the Snow Flake Crystals. It is designed especially for laundry use

Solvay Special Laundry Soda is a granular soda somewhat stronger than the regular soda for use on special laundry operations where a stronger alkali is needed

Solvay Cleansing Soda is a granular form of modified soda in two strengths X and XX for use in dairies, creameries and general cleansing operations.

SPECIAL PRODUCTS

Special mixtures designed for use in the leather industry are:

Tanners Soda
Tanners Alkali

Tanners Soda is a mild alkaline mixture prepared for use in the tanning of leather.

Tanners Alkali is a specially prepared mixture which is used in the tanning process when a stronger alkali than Tanners Soda is desired.

Packages

Tanners Soda—Barrels—280 lbs Net
Tanners Alkali—Barrels—300 lbs Net

Special compositions prepared for use in the manufacture of metal articles are.

Grade "A" Metal Cleaner
Grade "B" Metal Cleaner

Grade "A" Metal Cleaner is a specially prepared product which, in a hot water solution, removes oils and greases from the soft metals.

Grade "B" Metal Cleaner is a product of strong cleaning action designed for removing oils and grease from metals, unaffected by alkali, in exacting work.

Packages

Grade "A" Metal Cleaner—Barrels—300 lbs Net.
Grade "B" Metal Cleaner—Barrels—300 lbs. Net.

CROWN FILLER—$CaSO_4, 2H_2O$

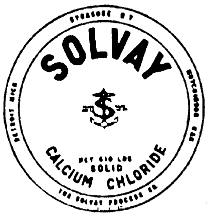
Crown Filler is an extremely pure sulphate of lime, of a beautiful crystal form. It is the highest grade paper filler known, and is unrivaled by any other filler.

THIS LABEL ON EVERY PACKAGE

CALCIUM CHLORIDE—$CaCl_2$

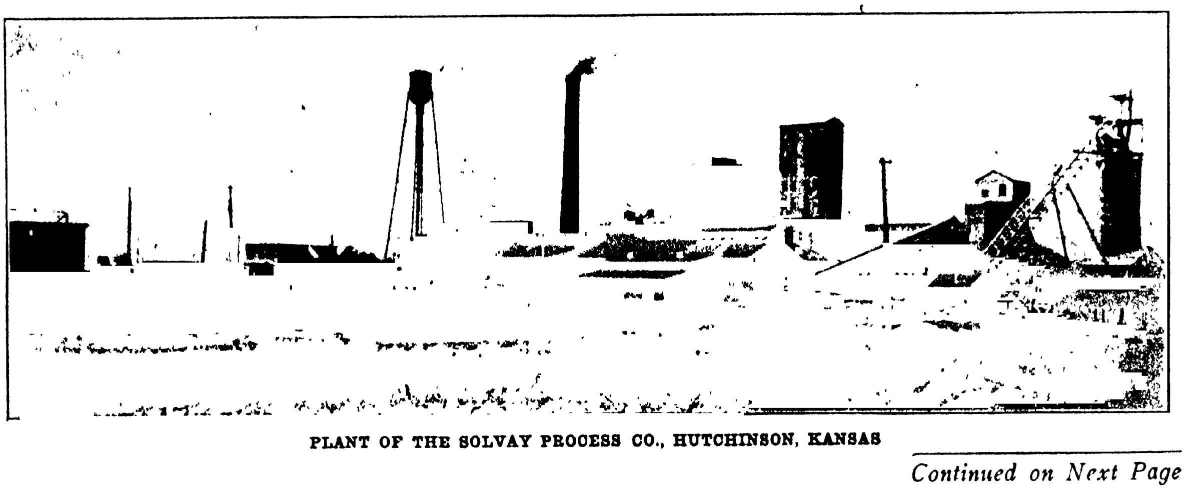
Calcium Chloride is furnished as 75% Solid, 75% Granulated, 75% Flake, 40% Liquid and 50% Liquid.

It is used as a Refrigeration Brine, for Cold Storage, Air Drying, drying Food Products, laying of Highway Dust, Weed Killing, Prevention of Coal Mine Explosions, in Coal Washing, Tempering of Metals, in the Canning Industry, and for Non-freezing solutions.



THIS LABEL ON EVERY PACKAGE

See our Special Pamphlets on Calcium Chloride.



PLANT OF THE SOLVAY PROCESS CO., HUTCHINSON, KANSAS

Continued on Next Page

LIMESTONE—$CaCO_3$

SOLVAY
GROUND LIMESTONE

THIS LABEL ON EVERY PACKAGE

At our extensive quarries of high grade limestone we have installed modern equipment for crushing, sizing and pulverizing limestone.

The crushed limestone is marketed for all concrete and road metal purposes, and is sized for those particular uses.

Solvay Pulverized Limestone for Farm Lands is ground to that degree of fineness required, and represents a superior article for farmers' use.

See our Special Pamphlet on Pulverized Limestone for Farm Lands.

LITERATURE

Blue Book—From time to time The Solvay Process Company has published notes on the various methods of testing and valuing alkalis in use in this country and abroad.

The latest edition of the Company's Blue Book, entitled "Solvay Alkali," treats fully of the above named topic and contains much other information of interest to Alkali users. We shall be glad to send you a copy on request made to the Technical Service Department, The Solvay Process Company, Syracuse, New York.

Solvay Bulletins—Every analytical chemist should receive regularly the "Solvay Bulletins" giving tested and approved methods of analysis for alkali products. We will be glad to place your name on the mailing list and send you a binder for the series.

TABLE FOR COMPARING DIFFERENT SYSTEMS OF ALKALIMETRY FOR SODA ASH

The following table gives the chemical and commercial equivalents for the different kinds of alkali On the continent of Europe, alkali is sold by its strength in carbonate of soda (Na_2CO_3), as per column No 1 of table In England, alkali is sold nominally on its strength in actual alkali (Na_2O) as per column No 2 of table, but actually on the so-called "Newcastle Test" of the actual alkali, as per column No 3 of table In the United States the commercial standard for 75 years has been the New York and Liverpool Test for actual alkali, as per column No 4 of table

No 1	No 2	No 3	No 4
Soda Ash Sodium Carbonate Na_2CO_3 Per Cent	Actual Alkali Sodium Oxide Na_2O Per Cent	Newcastle Test Sodium Oxide Na_2O Per Cent	N Y & Liv Sodium Oxide Na_2O Per Cent
79 51	46 5	47 11	48 00
80 37	47 0	47 62	48 51
81 22	47 5	48 12	49 03
82 07	48 0	48 63	49 54
82 93	48 5	49 14	50 06
83 78	49 0	49 64	50 58
84 64	49 5	50 15	51 09
85 48	50 0	50 66	51 61
86 34	50 5	51 16	52 12
87.19	51 0	51 67	52 64
88 05	51 5	52 18	53 16
88 90	52 0	52 68	53 67
89 76	52 5	53 19	54 19
90 61	53 0	53 70	54 70
91.47	53 5	54 20	55 22
92.32	54 0	54 71	55 74
93 18	54 5	55 22	56 25
94 03	55 0	55 72	56 77
94 89	55 5	56 23	57 29
95.74	56 0	56 74	57 80
96 60	56 5	57 24	58 32
97.45	57 0	57 75	58 83
98 31	57 5	58 26	59 35
99.16	58.0	58 76	59 87
100.00	58 5	59 27	60 38

TABLE FOR COMPARING DIFFERENT SYSTEMS OF ALKALIMETRY FOR CAUSTIC SODA

Caustic Soda is sold on its strength in Na_2O, as indicated in the New York and Liverpool Test column below

The price is always based on 60% Caustic, with a proportionate addition for the higher percentages

No 1	No 2	No 3	No 4
Caustic Soda Sodium Hydrate NaOH Per Cent	Actual Alkali Sodium Oxide Na_2O Per Cent	Newcastle Test Sodium Oxide Na_2O Per Cent	N Y & Liv Sodium Oxide Na_2O Per Cent.
74 83	58 0	58 76	59 87
75 48	58 5	59 27	60 38
76 12	59 0	59 77	60 90
76 77	59 5	60 28	61 42
77 40	60 0	60 79	61 93
78 05	60 5	61 30	62 45
78 70	61 0	61 80	62 97
79 35	61 5	62 31	63 48
80 00	62 0	62 82	64 00
80 65	62 5	63 32	64 52
81 29	63 0	63 83	65 03
81 94	63 5	64 33	65 55
82 58	64 0	64 84	66 06
83 23	64 5	65 35	66 58
83 87	65 0	65 85	67 10
84 52	65 5	66 36	67 61
85 16	66 0	66 87	68 13
85 81	66 5	67 37	68 65
86 45	67 0	67 88	69 16
87 10	67 5	68 39	69 68
87 74	68 0	68 89	70 19
88 39	68 5	69 40	70 71
89 03	69 0	69 91	71 23
89 67	69 5	70 41	71 74
90 30	70 0	70 92	72 26
90 95	70 5	71 43	72 77
91 60	71 0	71 93	73 29
92 25	71 5	72 44	73 81
92 90	72 0	72 95	74 32
93 55	72 5	73 45	74 84
94 19	73 0	73 96	75 35
94 84	73 5	74 47	75 87
95 48	74 0	74 97	76 39
96 13	74 5	75 48	76 90
96 77	75 0	75 99	77 42
97 32	75 5	76 49	77 94
98 06	76 0	77 00	78 45
98 71	76 5	77 51	78 97
99 35	77 0	78 01	79 49
100 00	77 5	78 52	80 00

SUMMARY OF SHIPPING WEIGHTS OF SOLVAY PRODUCTS

Net Weight Pounds

Product	Container	Gross	Tare	Net
58% Soda Ash Light	Bags 27" x 36"	302 lb	2 lb	300 lb
58% Soda Ash Light	Bbls	322 lb	avg 22 lb	300 lb
58% Soda Ash Dense	Bags 27" x 60"	452 lb	2 lb	450 lb
58% Soda Ash Dense	Bbls	472 lb	avg 22 lb	450 lb
48% Soda Ash Ordinary	Bbls	322 lb	avg 22 lb	300 lb
58% Soda Ash Ordinary	Bags 25" x 45"	151 lb	1 lb	150 lb
Solvay Laundry Soda	Bbls	302 lb	22 lb	280 lb
Solvay Cleansing Soda X	Bbls	302 lb	22 lb	280 lb
Solvay Cleansing Soda XX	Bbls	302 lb	22 lb	280 lb
Tanners Soda	Bbls	302 lb	22 lb	280 lb
Laundry Soda Special	Bbls	302 lb	22 lb	280 lb
Snow Flake	Bbls	302 lb	22 lb	280 lb
Snow Flake	Bbls	372 lb	22 lb.	350 lb
Snow Flake Special	½ Bbl			250 lb
Snow Flake Dense	½ Bbl			250 lb
Snow Flake Light	Bags 27" x 36"	302 lb	2 lb	300 lb
Caustic Ash 15%	Bbls	322 lb	22 lb	300 lb
Caustic Ash 25%	Bbls	322 lb	22 lb	300 lb
Caustic Ash 36%	Bbls	322 lb	22 lb	300 lb
Caustic Ash 45%	Bbls	322 lb	22 lb	300 lb
Tanners Alkali	Bbls	322 lb	22 lb	300 lb
76% Caustic Soda, Solid (1)	21" drums	695 lb	20 lb	675 lb
76% Caustic Soda, Solid (2)	15" drums	232 lb	11 lb	221 lb
76% Caustic Soda, Solid (3)	12" drums	121 lb	9 lb	112 lb
76% Caustic Soda Flake	21" drums	400 lb	20 lb	380 lb
76% Caustic Soda Flake	Bbls	585 lb avg	avg 60 lb	525 lb
76% Caustic Soda, Ground (1)	21" drums	420 lb	20 lb	400 lb
76% Caustic Soda, Ground (2)	15" drums	161 lb	11 lb	150 lb
76% Caustic Soda, Ground (3)	12" drums	94 lb	9 lb	85 lb
76% Caustic Soda, Ground	Bbls	635 lb avg	avg 60 lb	575 lb
74% Caustic Soda, Ground	May be packed the same as 76% Ground, and weights are the same			
74% Caustic Soda, Solid	May be packed in drums with the same standard weights as 76% Solid			
70% Caustic Soda, Solid	May be packed in drums with the same standard weights as 76% Solid			
60% Caustic Soda, Solid	May be packed in drums with the same standard weights as 76% Solid			
76% Caustic Soda, Solid	21" drums	315 kilos	9 kilos	306 kilos
76% Caustic Soda, Solid	15" drums	105 kilos	5 kilos	100 kilos
76% Caustic Soda, Solid	12" drums	54 kilos	4 kilos	50 kilos

SMITH CHEMICAL & COLOR CO., INC.

Importers, Exporters and Manufacturers

MAIN OFFICE AND WAREHOUSE
Corner Water Street and Peck Slip
NEW YORK, N. Y.

Cable Address
"SMITHKEMCO", New York
Code
ABC, 5th Edition
WORKS
Brooklyn, N. Y.

PRODUCTS

Chemicals for all Industrial, Scientific and Medicinal Purposes such as the manufacture of Rubber products, Pottery and Enamel Ware, Toilet Requisites, Composition Flooring, Matches and Pyrotechnics, Disinfectants and Exterminators, Bleaching of Textiles.

Dry Colors, Fillers and Lakes for Manufacturers of Rubber, Paints and Varnishes, Printing and Lithographic Inks, Wall Papers and Coverings, Leather Substitutes, Artificial Leathers, Paper and Cardboard, Linoleum and Oil-cloth, Stove, Metal, Shoe and Leather Polishes.

ACIDS
- Acetic, 56%, Commercial
- Phosphoric, U.S.P.
- Phosphoric, Technical
- Salicylic, U.S.P.
- Salicylic, Technical

AMMONIUM
- Chloride (Muriate, Sal Ammoniac)
  - For Electric Batteries
- Phosphate, 98-100%
  - For Fireproofing Wood

ANILINE OIL

ANTIMONY SULFURET
- Crimson and Golden, 15 to 17% Free Sulfur
- Specially produced for Rubber Compounding

"ASBESTINE," White Pigment Filler

BARIUM CHLORIDE

BARYTES
- White
- Off-color

BLANC FIXE
- Pulp
- Powdered

CARBON GAS BLACK

CARBON TETRACHLORIDE

CHINA CLAY
- Washed and Powdered

COPPER
- Carbonate, Technical
- Oxide, Red
- Sulfate, Crystals

FACE POWDER BASE

GLUE, RUBBER-MAKERS'

IRON
- Oxide, Red
- Sulfate (Copperas)

LAMPBLACK

LEAD
- Acetate (Sugar of Lead)
- Nitrate

LITHARGE

LITHOPONE, 30-50%

MAGNESIUM
- Carbonate, Commercial
- Oxide, Calcined
  - Light, Medium, Heavy
- Sulfate, U.S.P. (Epsom Salt)

NITROBENZOL (Oil of Myrbane)

PARA-DICHLOROBENZENE
- Preservation of Fruit Trees

OILS
- Citronella
- Palm-kernel

PHENOL (Carbolic Acid)
- U.S.P.
- Technical

SODIUM
- Nitrate
- Ferrocyanide (Yellow Prussiate)

SULFUR
- Flour
- Chloride, Red

TALC, FRENCH, POWDERED

TERRA ALBA

WHITING
- Imported and Domestic

WOOL GREASE, NEUTRAL

ZINC
- Oxide, Lead-free
- Stearate
- Sulfate

DRY COLORS, FILLERS AND LAKES
- Blacks
- Reds
- Whites
- Blues
- Yellows
- Browns
- Greens

QUALITY

Our policy being to render efficient service and distribute dependable merchandise at the lowest market value, we have established a reputation as Counselors and Specialists along Color and Chemical lines.

Our aim is to supply that grade of product best suited to the process of manufacture involved and the result to be attained.

INQUIRIES

We welcome inquiries concerning our products at all times, and shall be glad to confer with users of Chemicals and Colors regarding availability of supplies, grade of product required, specifications to be met, prices, etc.

STOCKS

We carry in stock at our New York warehouse stocks of our specialties, and of many other chemicals, and are thus able to make prompt deliveries.

LIMESTONE—$CaCO_3$

THIS LABEL ON EVERY PACKAGE

At our extensive quarries of high grade limestone we have installed modern equipment for crushing, sizing and pulverizing limestone.

The crushed limestone is marketed for all concrete and road metal purposes, and is sized for those particular uses.

Solvay Pulverized Limestone for Farm Lands is ground to that degree of fineness required, and represents a superior article for farmers' use.

See our Special Pamphlet on Pulverized Limestone for Farm Lands.

LITERATURE

Blue Book—From time to time The Solvay Process Company has published notes on the various methods of testing and valuing alkalis in use in this country and abroad.

The latest edition of the Company's Blue Book, entitled "Solvay Alkali," treats fully of the above named topic and contains much other information of interest to Alkali users. We shall be glad to send you a copy on request made to the Technical Service Department, The Solvay Process Company, Syracuse, New York.

Solvay Bulletins—Every analytical chemist should receive regularly the "Solvay Bulletins" giving tested and approved methods of analysis for alkali products. We will be glad to place your name on the mailing list and send you a binder for the series.

TABLE FOR COMPARING DIFFERENT SYSTEMS OF ALKALIMETRY FOR SODA ASH

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No 1	No 2	No 3	No 4
Soda Ash Sodium Carbonate Na_2CO_3 Per Cent	Actual Alkali Sodium Oxide Na_2O Per Cent	Newcastle Test Sodium Oxide Na_2O Per Cent	N Y & Liv Sodium Oxide Na_2O Per Cent
79.51	46.5	47.11	48.00
80.37	47.0	47.62	48.51
81.22	47.5	48.12	49.03
82.07	48.0	48.63	49.54
82.93	48.5	49.14	50.06
83.78	49.0	49.64	50.58
84.64	49.5	50.15	51.09
85.48	50.0	50.66	51.61
86.34	50.5	51.16	52.12
87.19	51.0	51.67	52.64
88.05	51.5	52.18	53.16
88.90	52.0	52.68	53.67
89.76	52.5	53.19	54.19
90.61	53.0	53.70	54.70
91.47	53.5	54.20	55.22
92.32	54.0	54.71	55.74
93.18	54.5	55.22	56.25
94.03	55.0	55.72	56.77
94.89	55.5	56.23	57.29
95.74	56.0	56.74	57.80
96.60	56.5	57.24	58.32
97.45	57.0	57.75	58.83
98.31	57.5	58.26	59.35
99.16	58.0	58.76	59.87
100.00	58.5	59.27	60.38

TABLE FOR COMPARING DIFFERENT SYSTEMS OF ALKALIMETRY FOR CAUSTIC SODA

Caustic Soda is sold on its strength in Na_2O, as indicated in the New York and Liverpool Test column below.

The price is always based on 60% Caustic, with a proportionate addition for the higher percentages.

No 1	No 2	No 3	No 4
Caustic Soda Sodium Hydrate NaOH Per Cent	Actual Alkali Sodium Oxide Na_2O Per Cent	Newcastle Test Sodium Oxide Na_2O Per Cent	N Y & Liv Sodium Oxide Na_2O Per Cent.
74.83	58.0	58.76	59.87
75.48	58.5	59.27	60.38
76.12	59.0	59.77	60.90
76.77	59.5	60.28	61.42
77.40	60.0	60.79	61.93
78.05	60.5	61.30	62.45
78.70	61.0	61.80	62.97
79.35	61.5	62.31	63.48
80.00	62.0	62.82	64.00
80.65	62.5	63.32	64.52
81.29	63.0	63.83	65.03
81.94	63.5	64.33	65.55
82.58	64.0	64.84	66.06
83.23	64.5	65.35	66.58
83.87	65.0	65.85	67.10
84.52	65.5	66.36	67.61
85.16	66.0	66.87	68.13
85.81	66.5	67.37	68.65
86.45	67.0	67.88	69.16
87.10	67.5	68.39	69.68
87.74	68.0	68.89	70.19
88.39	68.5	69.40	70.71
89.03	69.0	69.91	71.23
89.67	69.5	70.41	71.74
90.30	70.0	70.92	72.26
90.95	70.5	71.43	72.77
91.60	71.0	71.93	73.29
92.25	71.5	72.44	73.81
92.90	72.0	72.95	74.32
93.55	72.5	73.45	74.84
94.19	73.0	73.96	75.35
94.84	73.5	74.47	75.87
95.48	74.0	74.97	76.39
96.13	74.5	75.48	76.90
96.77	75.0	75.99	77.42
97.32	75.5	76.49	77.94
98.06	76.0	77.00	78.45
98.71	76.5	77.51	78.97
99.35	77.0	78.01	79.49
100.00	77.5	78.52	80.00

SUMMARY OF SHIPPING WEIGHTS OF SOLVAY PRODUCTS

Net Weight Pounds

Product	Container	Gross	Tare	Net
58% Soda Ash Light	Bags 27" x 56"	302 lb	2 lb	300 lb
58% Soda Ash Light	Bbls	322 lb	avg 22 lb	300 lb
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58% Soda Ash Dense	Bbls	472 lb	avg 22 lb	450 lb
48% Soda Ash Ordinary	Bbls	322 lb	avg 22 lb	300 lb
58% Soda Ash Ordinary	Bags 25" x 45"	151 lb	1 lb	150 lb
Solvay Laundry Soda	Bbls	302 lb	22 lb	280 lb
Solvay Cleansing Soda X	Bbls	302 lb	22 lb	280 lb
Solvay Cleansing Soda XX	Bbls	302 lb	22 lb	280 lb
Tanners Soda	Bbls	302 lb	22 lb	280 lb
Laundry Soda Special	Bbls	302 lb	22 lb	280 lb
Snow Flake	Bbls	302 lb	22 lb	280 lb
Snow Flake	Bbls	372 lb	22 lb.	350 lb
Snow Flake Special	½ Bbl			250 lb
Snow Flake Dense	½ Bbl			250 lb
Snow Flake Light	Bags 27" x 56"	302 lb	2 lb	300 lb
Caustic Ash 15%	Bbls	322 lb	22 lb	300 lb
Caustic Ash 25%	Bbls	322 lb	22 lb	300 lb
Caustic Ash 36%	Bbls	322 lb	22 lb	300 lb
Caustic Ash 45%	Bbls	322 lb	22 lb	300 lb
Tanners Alkali	Bbls	322 lb	22 lb	300 lb
76% Caustic Soda, Solid (1)	21" drums	695 lb	20 lb	675 lb
76% Caustic Soda, Solid (2)	15" drums	232 lb	11 lb	221 lb
76% Caustic Soda, Solid (3)	12" drums	121 lb	9 lb	112 lb
76% Caustic Soda Flake	21" drums	400 lb	20 lb	380 lb
76% Caustic Soda Flake	Bbls	585 lb avg	avg 60 lb	525 lb
76% Caustic Soda, Ground (1)	21" drums	420 lb	20 lb	400 lb
76% Caustic Soda, Ground (2)	15" drums	161 lb	11 lb	150 lb
76% Caustic Soda, Ground (3)	12" drums	94 lb	9 lb	85 lb
76% Caustic Soda, Ground	Bbls	635 lb avg	avg 60 lb	575 lb
74% Caustic Soda, Ground	May be packed the same as 76% Ground, and weights are the same			
74% Caustic Soda, Solid	May be packed in drums with the same standard weights as 76% Solid			
70% Caustic Soda, Solid	May be packed in drums with the same standard weights as 76% Solid			
60% Caustic Soda, Solid	May be packed in drums with the same standard weights as 76% Solid			
76% Caustic Soda, Solid	21" drums	315 kilos	9 kilos	306 kilos
76% Caustic Soda, Solid	15" drums	105 kilos	5 kilos	100 kilos
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TALC PRODUCTS COMPANY, INC.

120 Broadway
NEW YORK, N. Y.

MINE AND MILL
Glendon North Carolina

Cable Address
"STALLFORTH", New York

PRODUCTS

- Ground Talc
- Crayons

GROUND TALC

Quality

100 per cent. of our product will pass through a 200 mesh screen

Minimum free silica content

Physical and Chemical Characteristics

Our material is aluminum silicate, the mineral known as pyrophyllite. It is of a foliated, plate-like structure.

Specific Gravity 2.76

No calcium carbonate

Ferric oxide less than 1%

Greasy feel, excellent slip and plasticity; high retention value.

Entirely free from grease.

Color is white or cream, dependent on prospective uses.

Uses

Filler in high grade book papers, waterproof and fireproof paints and enamels, soaps, textiles, rubber goods, lubricants.

Dusting, polishing and lubricating material in the rubber, glass, tar-paper, leather and cork industries. These are the main uses so far established.

Attention is called to the various bulletins issued by the Bureau of Mines on the subject of talc and its numerous uses.

COOPERATION

We are anxious to serve you in developing a grade of material suitable for your particular needs.

MINE AND MILL

Located at Glendon, North Carolina.

Our plant is of recent design and is specially adapted to turning out a uniform high-grade product without interruption. The wet method of grinding is employed, using the Dorr system of classification.

CRAYONS

We produce Crayons of the standard sizes in the basic colors, and with varying degrees of hardness. Our Technical Department will gladly cooperate with the user as to the quality and type best suited for any special purposes.

An interesting list of many of the uses for Talc will be found in a general representation on page 1193, of this volume.

LIMESTONE—$CaCO_3$

THIS LABEL ON EVERY PACKAGE

At our extensive quarries of high grade limestone we have installed modern equipment for crushing, sizing and pulverizing limestone.

The crushed limestone is marketed for all concrete and road metal purposes, and is sized for those particular uses.

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79.51	46.5	47.11	48.00
80.37	47.0	47.62	48.51
81.22	47.5	48.12	49.03
82.07	48.0	48.63	49.54
82.93	48.5	49.14	50.06
83.78	49.0	49.64	50.58
84.64	49.5	50.15	51.09
85.48	50.0	50.66	51.61
86.34	50.5	51.16	52.12
87.19	51.0	51.67	52.64
88.05	51.5	52.18	53.16
88.90	52.0	52.68	53.67
89.76	52.5	53.19	54.19
90.61	53.0	53.70	54.70
91.47	53.5	54.20	55.22
92.32	54.0	54.71	55.74
93.18	54.5	55.22	56.25
94.03	55.0	55.72	56.77
94.89	55.5	56.23	57.29
95.74	56.0	56.74	57.80
96.60	56.5	57.24	58.32
97.45	57.0	57.75	58.83
98.31	57.5	58.26	59.35
99.16	58.0	58.76	59.87
100.00	58.5	59.27	60.38

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76.12	59.0	59.77	60.90
76.77	59.5	60.28	61.42
77.40	60.0	60.79	61.93
78.05	60.5	61.30	62.45
78.70	61.0	61.80	62.97
79.35	61.5	62.31	63.48
80.00	62.0	62.82	64.00
80.65	62.5	63.32	64.52
81.29	63.0	63.83	65.03
81.94	63.5	64.33	65.55
82.58	64.0	64.84	66.06
83.23	64.5	65.35	66.58
83.87	65.0	65.85	67.10
84.52	65.5	66.36	67.61
85.16	66.0	66.87	68.13
85.81	66.5	67.37	68.65
86.45	67.0	67.88	69.16
87.10	67.5	68.39	69.68
87.74	68.0	68.89	70.19
88.39	68.5	69.40	70.71
89.03	69.0	69.91	71.23
89.67	69.5	70.41	71.74
90.30	70.0	70.92	72.26
90.95	70.5	71.43	72.77
91.60	71.0	71.93	73.29
92.25	71.5	72.44	73.81
92.90	72.0	72.95	74.32
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94.84	73.5	74.47	75.87
95.48	74.0	74.97	76.39
96.13	74.5	75.48	76.90
96.77	75.0	75.99	77.42
97.32	75.5	76.49	77.94
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76% Caustic Soda, Ground	Bbls	635 lb avg	avg 60 lb	575 lb
74% Caustic Soda, Ground	May be packed the same as 76% Ground, and weights are the same			
74% Caustic Soda, Solid	May be packed in drums with the same standard weights as 76% Solid			
70% Caustic Soda, Solid	May be packed in drums with the same standard weights as 76% Solid			
60% Caustic Soda, Solid	May be packed in drums with the same standard weights as 76% Solid			
76% Caustic Soda, Solid	21" drums	315 kilos	9 kilos	306 kilos
76% Caustic Soda, Solid	15" drums	105 kilos	5 kilos	100 kilos
76% Caustic Soda, Solid	12" drums	54 kilos	4 kilos	50 kilos

TEXAS GULF SULPHUR COMPANY

41 EAST 42ND STREET, NEW YORK, N. Y.

DEPOSIT AND PLANT
Gulf Matagorda County Texas

Cable Address
"LONSTARSULF", New York
Western Union Code, 5 letter Edition

PRODUCT

Crude sulfur (brimstone) 99½% pure, free from arsenic, selenium and tellurium.

SULFUR INDUSTRY

The United States produces the only sulfur which is obtained directly in a substantially pure state, requiring no rectification. This fact, together with the vast tonnage produced by the three companies which mine virtually all the American sulfur, makes possible the present domination of the sulfur industry by the United States.

DEPOSIT

The "Big Dome" deposit of the Texas Gulf Sulphur Co. is located at Gulf, Matagorda County, Texas. The main deposit is from 800 to 1000 feet below the surface. The total holdings of this company are approximately 4000 acres.

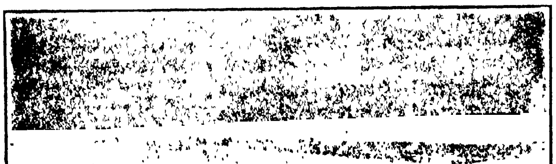
PRODUCTION

Sulfur production by this company was initiated in March, 1919, and has been practically continuous at the rate of 1000 to 5000 gross tons daily. Practically all sulfur mined in the United States is obtained by the hot water method, and producers have carried enormous stocks above ground.

The production in the two and a half years since operations were initiated exceeds two million (2,000,000) long tons, which is probably in excess of the total production of all other sulfur producers.

STOCKS AND SHIPPING FACILITIES

Large stocks are always carried at the mine, as well as at the port of Galveston, where facilities are maintained for loading bulk sulfur cargoes for delivery to all parts of the world.



STORAGE BINS AND LOADING TRACKS

USES OF SULFUR

The most important use of crude sulfur is for the manufacture of sulfuric acid. The advantages of the use of sulfur instead of pyrites are many and marked: A very much smaller amount of material is handled (less than one-half); the burning equipment for the generation of the sulfur dioxide is simple and inexpensive; no large tonnage of cinders or other residue remains to be disposed of; American sulfur is constant in composition, free from arsenic, selenium, tellurium, and other interfering impurities, thereby yielding a purer acid; a higher rate of production per given unit of lead chamber space is obtained.

A further extremely important use of sulfur is the pulp and paper industry.

Sulfur dioxide finds extensive use in the production of sodium sulfite, sodium bisulfite, sodium sulfate and other salts.

Sulfur is being used in large amounts as a direct fertilizer; in fertilizer composts; as an insecticide and fungicide; as well as for the production of lime-sulfur and other insecticidal sprays.

In the rubber industry sulfur is indispensable, as it is the means by which crude rubber is vulcanized.

Other important uses are the production of carbon bisulfide, the important solvent and the raw material for the manufacture of carbon tetrachloride.

Further uses are for the production of cements, fumigating, medicine (both internally and externally), and the bleaching of straw and the like, manufacture of matches, sewer-pipe joints (mixed with sand), etc.

SULFUR MIXTURES

The ordinary mixture of sand and sulfur has merits which deserve a wider knowledge of its properties. The mixture which is best for most uses is that of 40 of sulfur and 60 of sand (parts by weight). The tensile strengths of sulfur-sand mixtures as measured in the usual manner for testing cement were as follows:

Percentage of Sulfur by Weight	Tensile Strength Lb. per Sq In
25	90
35	310
40	400
45	310
50	110
100	250

Other fillers have given tensile strengths of 800 and even 1100 lb. The 40-60 sulfur-sand mixture can be used as an acid-resistant concrete, for making acid-resisting pipe, tanks, gutters, launders, etc.

In the case of acid tanks, the sand should be free from limestone or other acid-soluble constituents.

Pipes cast of this sulfur-sand mixture show no deterioration after one year in 5 per cent. hydrochloric or 5 per cent. sulfuric acid. The ordinary organic acids have no effect on such a mixture.

PROSPECTIVE USES OF SULFUR

Sulfur possesses the following physical properties which suggest certain possible important uses:

Poor conductivity of heat; Low electrical conductivity; Resistance to wetting by water; Inertness toward most acids; Physical strength; Non-compressibility; Fusibility.

These properties suggest. Heat-insulating materials; Electrical insulation; Waterproof cements; Acid-proof cements; Acid-proof construction materials.

The objectionable property of sulfur, its brittleness, can readily be overcome by mixing it with sand, asbestos, slag-wool, paper-pulp, etc., or by reenforcing it with wire screen. Mixing it with inert materials would also materially reduce the fire hazard.

Sulfur is odorless and practically tasteless, and is flammable only in cases of application of fire.

PHYSICAL AND CHEMICAL PROPERTIES

Boiling-point—444.6°C. or 832.3°F.

Compressibility—Average fractional change of volume caused by 1 megabar change in pressure between 100-500 megabars = 0.0000125. 1 Megabar = 0.987 Atmospheres.

Continued on Next Page

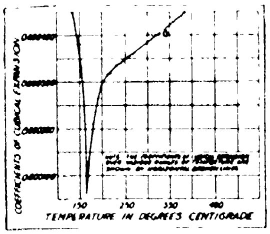
Electrical Conductivity—(Measured on a 1 cm cube, as reciprocal value of Resistivity in ohms)

Temperature Cent.	Temperature Fahr	Conductivity
22°	72°	1×10^{-17}
69°	156°	0.254×10^{-14}
115°	239°	0.105×10^{-11}
130°	266°	0.5×10^{-10}
430°	806°	0.1×10^{-7}
Compare		
Porcelain		0.1×10^{-14}
Mica		$0.1 \times 10^{-[illegible]}$
Ebonite		$1 \times 10^{-[illegible]}$

It requires 20,000 volts AC to produce a disruptive discharge through ¼ inch of molten sulfur while good transformer oil requires 30,000 volts and air is pierced at 6000 volts.

Expansion—

Cubical



COEFFICIENTS OF CUBICAL EXPANSION

Linear

Temperature Cent	Temperature Fahr	Ex Coeff
0°—13°	32°—56°	0.000046
13°—50°	56°—122°	0.00007
50°—78°	122°—173°	0.00009
78°—97°	173°—207°	0.0002
97°—110°	207°—230°	0.001

Forms—

Crystalline

(a) Rhombic — Ordinary Stable below 96°C or 205 F Sp gr 2.07.

(b) Monoclinic — Stable above 96°C or 205 F Sp gr 1.96

(c) Milk of Sulfur—Formed, e g, by action of dilute acids on polysulfides. Generally called amorphous, but shown by Smith and Brownlee to be crystalline

There are several other modifications of crystalline sulfur of scientific interest but not of general importance

Liquid

At 113°C. or 235°F Sp gr. 1.81

Contains: Sulfur (Liquid soluble) Sλ, Sulfur (Liquid insoluble, or amorphous) Sμ.

The proportion of Sμ to Sλ increases with the temperature

Amorphous—Sμ

Solid—Sp gr 1.89

Plastic Sulfur—Formed by heating sulfur above viscous stage, 162°C. or 324°F and cooling quickly Sp gr 1.88

Elastic Sulfur—Formed by heating sulfur above 400°C or 752°F and pouring in thin stream into liquid air Its elastic properties are soon lost.

Heat Conductivity—(Measured as the number of gram calories transmitted in one second through a plate 1 cm thick and having surfaces 1 sq cm in area when opposite faces differ in temperature by 1°C)

20°-100°C or 68°-212°F 0.0006—Gm Calories

Heat of Combustion

	G cal per g Sulfur	B T U per lb
$S + O_2$ to SO_2	2200	3960
S to H_2SO_3 (dilute)	2450	4410
S to H_2SO_4 (dilute)	4450	8010

Heat of Fusion

	G cal per g	B T U per lb
Rhombic at 100°C or 212°F	14.9	26.8
Monoclinic at 100°C or 212°F	11.5	20.7
To form pure liquid Sulfur (Sλ)		
From Rhombic	14.5	26.1
From Monoclinic	11.1	20.0

Heat of Solution in Carbon Disulfide

	G cal per g	B T U. per lb
Dilute solution	—11.89	—21.4
Saturated solution	—11.55	—20.9

Heat of Vaporization

Temperature Cent	Temperature Fahr	G cal per g	B T U per lb
444.6°	832.3°	70 (approx)	126 (approx)

Ignition Temperature—248°C. or 478°F

International Atomic Weight 1920 = 32.06.

Melting-point

	Temperature Cent	Temperature Fahr
Rhombic	112.8°	235°
Monoclinic	119.25°	246.7°

Natural Freezing point Sλ and Sμ in equilibrium (96.3% Sλ, 3.7% Sμ) 110.2°C or 230.4°F.

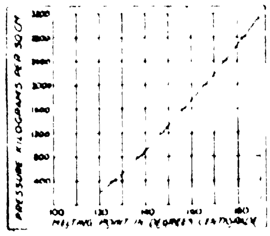
Specific Heat

	Temperature Cent	Temperature Fahr	Sp Ht
Rhombic	0°—95°	32°—203°	0.1751
Liquid	160°—201°	320°—393°	0.279
	201°—233°	393°—451°	0.381

Specific Gravity

Amorphous	1.9556
Yellow	2.046
Monoclinic	1.958
Rhombic	2.06

Melting-point change



CHANGE OF MELTING-POINT WITH PRESSURE

Solubilities

Solvent	Temperature Cent	Temperature Fahr	Solubility g in 100 g Solution
Amyl Alcohol	95°	203°	1.5
	110	230	2.1
Aniline	89.5	193.1	8.8
	130	266	16.2
Benzol	25	77	2.1
	70	158	8.0
Carbon Disulfide	—20	—4	10.5
	10	14	13.5
	0	32	18
	20	68	29.5
	50	122	59
	100	212	92
Carbon Tetrachloride	25	77	0.86
Chloroform	22	71.6	1.2
Coal tar Oil			
Sp Gr 0.87	15	59	2
	100	212	13
Sp Gr 1.02	15	59	6.5
	110	230	53.5
Ethyl Ether	23.5	74.3	0.97
Linseed Oil	15	59	0.4
	160	320	9.0
Olive Oil (Sp Gr 0.885)	15	59	2.2
	130	266	30
Sulfur Chloride	0	32	11
	55.2	131.4	43
	86	186.8	89
Phenol	175	346	26.7
Toluol	23	73.4	1.48
Turpentine, Oil of	16	60.8	1.33
Boiling point			13.9

Surface Tension

Temperature Cent	Temperature Fahr	Surface Tension Mg per mm
120°	248°	5.75
131°	267.8°	6.12
146°	294.8°	6.05
195°	383°	6.62

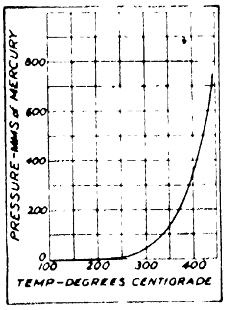
Tensile Strength 200 pounds per square inch (approximate)

Vapor Density At B P corresponds approximately to formula S_8 At 1000°C or 1832°F corresponds approximately to formula S_2

Transition Temperature

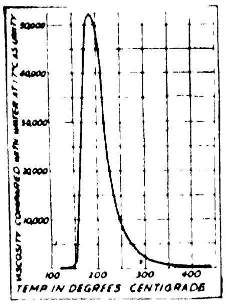
MONOCLINIC Pressure Kg/cm²	MONOCLINIC Pressure lbs/in²	RHOMBIC Temperature Cent	RHOMBIC Temperature Fahr
10.6	15	96°	204.8°
123	175	100.1°	212.2°
638	907	120°	248°
1350.	1920	150°	302°

Vapor Pressure



VAPOR PRESSURE OF SULPHUR

Viscosity



CHANGE OF VISCOSITY OF LIQUID SULPHUR

Weight per Cubic Foot—Broken sulfur in bins, 85 lbs per cubic foot.

Angle of Repose—35 Degrees

TOWER MANUFACTURING CO., INC.

Dyestuffs Department

326 BROADWAY, NEW YORK, N. Y.

FACTORIES
Brooklyn, N. Y.
Newark, N. J.

Cable Address
"JOURNALIZE", New York

PRODUCTS

Para-phenylenediamine and a complete assortment of other Fur Colors.

Methyl Violet
Fuchsine
Rosaniline Base
Magenta Base
Alkali Blue
Indigotine
Indigo Extract
Indophenal Colors

FUR COLORS

A complete assortment of Fur Colors, as follows:

Para-phenylenediamine—designed under our trade name "Furol D," also known as Fur Black.

"Furol P"—also known as Fur Brown.

"Furol A"—which produces a blue-black shade.

"Furol GG"—which produces a yellowish tint.

"Furol DB"—also known as Fur Blue.

"Furol X"—which also produces a brown tint.

"Furol DD"—which produces a blue shade.

Para-phenylenediamine is packed for export in steel drums, gross 410 lb., tare 60, net 350 lb., measurements 32" x 24", cubic contents 8.7 cu. ft. Domestic packing wooden barrels containing 275 lb. gross, tare 25 lb., net 250 lb.

All other Fur Colors are packed in kegs containing 100 pounds net.

METHYL VIOLET

This material is full strength, very soluble, and is available in either lump or powder form.

Packed in wooden barrels,
Lumps: gross 335 lb., tare 75, net 260 lb.,
Powder: gross 375 lb., tare 75, net 300 lb.,
measurements 34½" x 24½" x 21",
cubic contents 8.0 cu. ft.

FUCHSINE

This material is full strength, very soluble and is available in the form of large diamond crystals, crystalline and powder.

Packed in wooden barrels,
Large diamond crystals and crystalline: gross 375 lb., tare 75, net 300 lb.,
Powder: gross 300 lb., tare 75, net 225 lb.,
measurements 34½" x 24½" x 21",
cubic contents 8.0 cu. ft.

ROSANILINE BASE

This material is full strength, very soluble and is available in the form of a powder.

Packed in wooden barrels,
gross 375 lb., tare 75, net 300 lb.,
measurements 34½" x 24½" x 21",
cubic contents 8.0 cu. ft.

MAGENTA BASE

This material is full strength, very soluble and is available in the form of a powder.

Packed in wooden barrels,
gross 375 lb., tare 75, net 300 lb.,
measurements 34½" x 24½" x 21",
cubic contents 8.0 cu. ft.

ALKALI BLUE

This is full strength and a very soluble product.

Packed in 100 pound kegs net.

INDIGOTINE "A"

This is standard quality material.

Packed in barrels, gross 570 lb., tare 70 lb., net 500 lb.

INDIGOTINE "B" CONC.

This is a concentrated type of material, with a very bright shade.

Packed in barrels, gross 570 lb., tare 70 lb., net 500 lb.

INDIGO EXTRACT

This is standard quality material.

Packed in barrels, gross 520 lb., tare 70 lb., net 450 lb.

INDOPHENAL COLORS

This is a new group or series of dyes originated and manufactured exclusively by this Company. They are characterized by their brilliancy of shade and remarkable fastness to light, washing and rubbing, and superior fastness to acid, alkali, fulling and boiling. The Indophenal colors partake of the nature of sulphur colors in that they are reduced by the addition of Sodium Sulphide, thus possessing the added advantage of simplicity in the method of application.

The following types are available for regular delivery:

Indophenal Blue R Conc.—A brilliant, exceedingly red shade of blue, of very great concentration.

Indophenal Blue R—Standard concentration, of great brilliancy and extreme red shade.

Indophenal Sky Blue—A brilliant highly concentrated greenish type of blue of great clearness of shade.

Other equally important types are in preparation, and will be ready for distribution shortly.

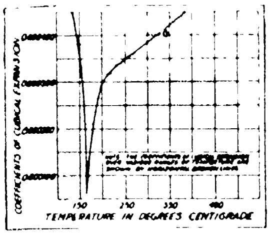
Electrical Conductivity—(Measured on a 1 cm cube, as reciprocal value of Resistivity in ohms)

Temperature Cent.	Temperature Fahr	Conductivity
22°	72°	1×10^{-17}
69°	156°	0.254×10^{-14}
115°	239°	0.105×10^{-11}
130°	266°	0.5×10^{-10}
430°	806°	0.1×10^{-7}
Compare		
Porcelain		0.1×10^{-14}
Mica		0.1×10^{-15}
Ebonite		1 [illegible] $\times 10^{-11}$

It requires 20,000 volts AC to produce a disruptive discharge through 1/4 inch of molten sulfur while good transformer oil requires 30,000 volts and air is pierced at 6000 volts.

Expansion—

Cubical



COEFFICIENTS OF CUBICAL EXPANSION

Linear

Temperature Cent	Temperature Fahr	Ex Coeff
0°—13°	32°—56°	0.000046
13°—50°	56°—122°	0.00007
50°—78°	122°—173°	0.00009
78°—97°	173°—207°	0.0002
97°—110°	207°—230°	0.001

Forms—

Crystalline

(a) Rhombic — Ordinary Stable below 96°C or 205 F Sp gr 2.07.

(b) Monoclinic — Stable above 96°C or 205 F Sp gr 1.96

(c) Milk of Sulfur—Formed, e.g., by action of dilute acids on polysulfides. Generally called amorphous, but shown by Smith and Brownlee to be crystalline

There are several other modifications of crystalline sulfur of scientific interest but not of general importance

Liquid

At 113°C. or 235°F Sp gr. 1.81

Contains: Sulfur (Liquid soluble) Sλ, Sulfur (Liquid insoluble, or amorphous) Sμ.

The proportion of Sμ to Sλ increases with the temperature

Amorphous—Sμ

Solid—Sp gr 1.89

Plastic Sulfur—Formed by heating sulfur above viscous stage, 162°C. or 324°F and cooling quickly Sp gr 1.88

Elastic Sulfur—Formed by heating sulfur above 400°C or 752°F and pouring in thin stream into liquid air Its elastic properties are soon lost.

Heat Conductivity—(Measured as the number of gram calories transmitted in one second through a plate 1 cm thick and having surfaces 1 sq cm in area when opposite faces differ in temperature by 1°C)

20°-100°C or 68°-212°F 0.0006—Gm Calories

Heat of Combustion

	G cal per g Sulfur	B T U per lb
$S + O_2$ to SO_2	2200	3960
S to H_2SO_3 (dilute)	2450	4410
S to H_2SO_4 (dilute)	4450	8010

Heat of Fusion

	G cal per g	B T U per lb
Rhombic at 100°C or 212°F	14.9	26.8
Monoclinic at 100°C or 212°F	11.5	20.7
To form pure liquid Sulfur (Sλ)		
From Rhombic	14.5	26.1
From Monoclinic	11.1	20.0

Heat of Solution in Carbon Disulfide

	G cal per g	B T U. per lb
Dilute solution	−11.89	−21.4
Saturated solution	−11.55	−20.9

Heat of Vaporization

Temperature Cent	Temperature Fahr	G cal per g	B T U per lb
444.6°	832.3°	70 (approx.)	126 (approx.)

Ignition Temperature—248°C. or 478°F

International Atomic Weight 1920 = 32.06.

Melting-point

	Temperature Cent	Temperature Fahr
Rhombic	112.8°	235°
Monoclinic	119.25°	246.7°

Natural Freezing point Sλ and Sμ in equilibrium (96.3% Sλ, 3.7% Sμ) 110.2°C or 230.4°F.

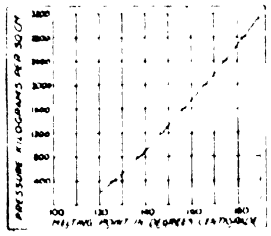
Specific Heat

	Temperature Cent	Temperature Fahr	Sp Ht
Rhombic	0°—95°	32°—203°	0.1751
Liquid	160°—201°	320°—393°	0.279
	201°—233°	393°—451°	0.331

Specific Gravity

Amorphous	1.9556
Yellow	2.046
Monoclinic	1.958
Rhombic	2.06

Melting-point change



CHANGE OF MELTING-POINT WITH PRESSURE

Solubilities

Solvent	Temperature Cent	Temperature Fahr	Solubility g in 100 g Solution
Amyl Alcohol	95°	203°	1.5
	110	230	2.1
Aniline	89.5	193.1	8.8
	130	266	16.2
Benzol	25	77	2.1
	70	158	8.0
Carbon Disulfide	−20	−4	10.5
	10	14	13.5
	0	32	18
	20	68	29.5
	50	122	59
	100	212	92
Carbon Tetrachloride	25	77	0.86
Chloroform	22	71.6	1.2
Coal tar Oil			
Sp Gr 0.87	15	59	2
	100	212	13
Sp Gr 1.02	15	59	6.5
	110	230	53.5
Ethyl Ether	23.5	74.3	0.97
Linseed Oil	15	59	0.4
	160	320	9.0
Olive Oil (Sp Gr 0.885)	15	59	2.2
	130	266	30
Sulfur Chloride	0	32	11
	55.2	131.4	43
	86	186.8	89
Phenol	175	346	26.7
Toluol	23	73.4	1.48
Turpentine, Oil of	16	60.8	1.33
Boiling point			13.9

Surface Tension

Temperature Cent	Temperature Fahr	Surface Tension Mg per mm
120°	248°	5.74
131°	267.8°	6.12
146°	294.8°	6.05
195°	383°	6.62

Tensile Strength 200 pounds per square inch (approximate)

Vapor Density At B P corresponds approximately to formula S_8 At 1000°C or 1832°F corresponds approximately to formula S_2

Transition Temperature

MONOCLINIC Pressure Kg/cm²	MONOCLINIC Pressure lbs/in²	RHOMBIC Temperature Cent	RHOMBIC Temperature Fahr
10.6	15	96°	204.8°
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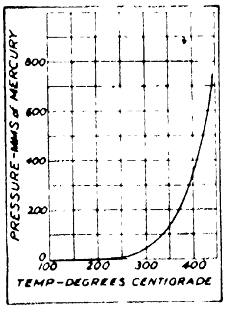
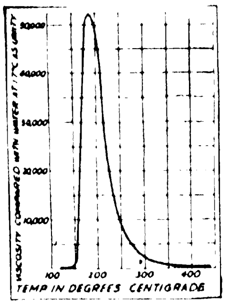
Vapor Pressure



VAPOR PRESSURE OF SULPHUR

Viscosity



CHANGE OF VISCOSITY OF LIQUID SULPHUR

Weight per Cubic Foot—Broken sulfur in bins, 85 lbs per cubic foot.

Angle of Repose—35 Degrees

UNION CHEMICAL COMPANY

Industrial Chemicals for All Purposes

27 Haymarket Square
BOSTON, MASS.

Highest Quality

UNICO

Personal Service

NEW ENGLAND AGENTS FOR

Hercules Powder Co., Naval Stores Division Robinson & Stevens Strahl & Pitsch

---

PRODUCTS

- **Naval Stores**
  - Rosin
  - Turpentine
  - Pine Oils
  - Pitch
  - Rosin Oils
  - Pine Tar
  - Crude Turpentine
  - Gum Thus
- **Blacks**
  - Carbon
  - Bone
  - Drop
  - Ivory
  - Lamp
- **Red Oxide of Iron**
  - All Grades
- **Heavy Chemicals**
  - Nitric Acid
  - Muriatic Acid
  - Sulphuric Acid
  - Soda Ash
- **Mineral Rubber**
- **Gilsonite**
- **Waxes**
  - Paraffin
  - Carnauba
  - Beeswax
  - Ceresine
  - Spermaceti
  - Candelilla
  - Palm
  - Montan
  - Ozokerite
- **Aniline Colors**
  - Acid
  - Basic
  - Direct
  - Sulphur
- **Mineral Fillers**
  - Aluminum Flake
  - Asbestine
  - Barytes
  - Whiting
  - Zinc Oxide
  - Lithopone
- **Glues**
  - Bone
  - Dry Hide

GUM ROSIN

We carry all grades of Rosin for use in soap, paper, paint and varnish, waterproofing compounds and specialties.

YARYAN "F" WOOD ROSIN

More uniform in quality than gum rosin, and absolutely free from dirt and foreign matter. The color is a clear cherry red, somewhat darker than the corresponding grade of gum rosin

In practically every case where "F" gum rosin is used, Yaryan "F" may be used with a distinct saving in the cost, due to its cleanness and uniformity.

Mill tests have demonstrated that it is very superior for sizing the darker grades of papers, fiber board, etc

PURE GUM SPIRITS OF TURPENTINE

We are agents for large producers and carry stocks at all times.

YARYAN STEAM DISTILLED TURPENTINE

This Turpentine conforms to all standard specifications. Due to chemically controlled production methods, it runs absolutely uniform and will meet every industrial requirement

PINE TREE PRODUCTS

A full line of Rosin Oils, Tar Oils, Tar, Venice Turpentine, Crude Turpentine, Pitches, etc.

BLACKS

High grade pure natural gas Carbon Black for use in the manufacture of rubber, paper, printing ink, artificial leather and paint and varnish. We have several grades and are prepared to offer one most suitable for your use.

We call special attention to our Compressed Carbon Black for use by rubber manufacturers, it being compressed to such an extent that it does not fly around, yet distributes easily and thoroughly throughout the compound.

ANILINE COLORS

We have a full line of these products for use by all industries and are prepared to furnish formulas for any desired shades.

WAXES

We have a complete line of Mineral, Animal, and Vegetable Waxes of the highest grades for use in waterproofing compounds, polishes, shoe dressings and specialties.

HEAVY CHEMICALS

We have direct connections with producers of Acids, Soda Ash, Caustic Soda, and other industrial chemicals for all purposes.

MINERAL FILLERS

We offer to the rubber and paper trade a complete line of Mineral Fillers of the highest grade.

GLUES

Our Glues are produced by one of the oldest and most reliable glue manufacturers in the world and we can supply the highest grade bone and dry hide glues and glue compounds.

SERVICE

We maintain a technical service department, which is at the disposal of our customers at all times and in addition we offer our services in locating chemicals which are seldom found on the regular markets.

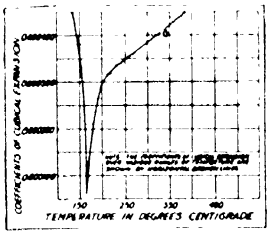
Electrical Conductivity—(Measured on a 1 cm cube, as reciprocal value of Resistivity in ohms)

Temperature Cent.	Temperature Fahr	Conductivity
22°	72°	1 × 10^{-17}
69°	156°	0.254 × 10^{-14}
115°	239°	0.105 × 10^{-11}
130°	266°	0.5 × 10^{-10}
430°	806°	0.1 × 10^{-7}
Compare		
Porcelain		0.1 × 10^{-14}
Mica		0.1 × 10^{-15}
Ebonite		1.[illegible] × 10 [illegible]

It requires 20,000 volts AC to produce a disruptive discharge through ¼ inch of molten sulfur while good transformer oil requires 30,000 volts and air is pierced at 6000 volts.

Expansion—

Cubical



COEFFICIENTS OF CUBICAL EXPANSION

Linear

Temperature Cent	Temperature Fahr	Ex Coeff
0°—13°	32°—56°	0.000046
13°—50°	56°—122°	0.00007
50°—78°	122°—173°	0.00009
78°—97°	173°—207°	0.0002
97°—110°	207°—230°	0.001

Forms—

Crystalline

(a) Rhombic — Ordinary Stable below 96°C or 205 F Sp gr 2.07.

(b) Monoclinic — Stable above 96°C or 205 F Sp gr 1.96

(c) Milk of Sulfur—Formed, e g, by action of dilute acids on polysulfides. Generally called amorphous, but shown by Smith and Brownlee to be crystalline

There are several other modifications of crystalline sulfur of scientific interest but not of general importance

Liquid

At 113°C. or 235°F Sp gr. 1.81

Contains: Sulfur (Liquid soluble) Sλ, Sulfur (Liquid insoluble, or amorphous) Sμ.

The proportion of Sμ to Sλ increases with the temperature

Amorphous—Sμ

Solid—Sp gr 1.89

Plastic Sulfur—Formed by heating sulfur above viscous stage, 162°C. or 324°F and cooling quickly Sp gr 1.88

Elastic Sulfur—Formed by heating sulfur above 400°C or 752°F and pouring in thin stream into liquid air Its elastic properties are soon lost.

Heat Conductivity—(Measured as the number of gram calories transmitted in one second through a plate 1 cm thick and having surfaces 1 sq cm in area when opposite faces differ in temperature by 1°C)

20°-100°C or 68°-212°F 0.0006—Gm Calories

Heat of Combustion

	G cal per g Sulfur	B T U per lb
S + O_2 to SO_2	2200	3960
S to H_2SO_3 (dilute)	2450	4410
S to H_2SO_4 (dilute)	4450	8010

Heat of Fusion

	G cal per g	B T U per lb
Rhombic at 100°C or 212°F	14.9	26.8
Monoclinic at 100°C or 212°F	11.5	20.7
To form pure liquid Sulfur (Sλ)		
From Rhombic	14.5	26.1
From Monoclinic	11.1	20.0

Heat of Solution in Carbon Disulfide

	G cal per g	B T U. per lb
Dilute solution	−11.89	−21.4
Saturated solution	−11.55	−20.9

Heat of Vaporization

Temperature Cent	Temperature Fahr	G cal per g	B T U per lb
444.6°	832.3°	70 (approx.)	126 (approx.)

Ignition Temperature—248°C. or 478°F

International Atomic Weight 1920 = 32.06.

Melting-point

	Temperature Cent	Temperature Fahr
Rhombic	112.8°	235°
Monoclinic	119.25°	246.7°

Natural Freezing point Sλ and Sμ in equilibrium (96.3% Sλ, 3.7% Sμ) 110.2°C or 230.4°F.

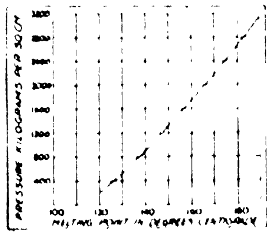
Specific Heat

	Temperature Cent	Temperature Fahr	Sp Ht
Rhombic	0°—95°	32°—203°	0.1751
Liquid	160°—201°	320°—393°	0.279
	201°—233°	393°—451°	0.331

Specific Gravity

Amorphous	1.9556
Yellow	2.046
Monoclinic	1.958
Rhombic	2.06

Melting-point change



CHANGE OF MELTING-POINT WITH PRESSURE

Solubilities

Solvent	Temperature Cent	Temperature Fahr	Solubility g in 100 g Solution
Amyl Alcohol	95°	203°	1.5
	110	230	2.1
Aniline	89.5	193.1	8.8
	130	266	16.2
Benzol	25	77	2.1
	70	158	8.0
Carbon Disulfide	−20	−4	10.5
	−10	14	13.5
	0	32	18
	20	68	29.5
	50	122	59
	100	212	92
Carbon Tetrachloride	25	77	0.86
Chloroform	22	71.6	1.2
Coal tar Oil			
Sp Gr 0.87	15	59	2
	100	212	13
Sp Gr 1.02	15	59	6.5
	110	230	53.5
Ethyl Ether	23.5	74.3	0.97
Linseed Oil	15	59	0.4
	160	320	9.0
Olive Oil (Sp Gr 0.885)	15	59	2.2
	130	266	30
Sulfur Chloride	0	32	11
	55.2	131.4	43
	86	186.8	89
Phenol	175	346	20.7
Toluol	23	73.4	1.48
Turpentine, Oil of	16	60.8	1.33
Boiling point			13.9

Surface Tension

Temperature Cent	Temperature Fahr	Surface Tension Mg per mm
120°	248°	5.76
131°	267.8°	6.12
146°	294.8°	6.05
195°	383°	6.62

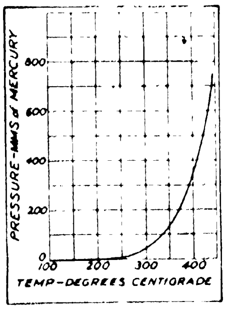
Tensile Strength 200 pounds per square inch (approximate)

Vapor Density At B P corresponds approximately to formula S_8 At 1000°C or 1832°F corresponds approximately to formula S_2

Transition Temperature

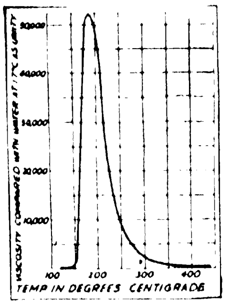
MONOCLINIC Pressure Kg/cm²	MONOCLINIC Pressure lbs/in²	RHOMBIC Temperature Cent	RHOMBIC Temperature Fahr
10.6	15	96°	204.8°
123	175	100.1°	212.2°
638	907	120°	248°
1350.	1920	150°	302°

Vapor Pressure



VAPOR PRESSURE OF SULPHUR

Viscosity



CHANGE OF VISCOSITY OF LIQUID SULPHUR

Weight per Cubic Foot—Broken sulfur in bins, 85 lbs per cubic foot.

Angle of Repose—35 Degrees

U. S. INDUSTRIAL ALCOHOL CO.

EXECUTIVE OFFICES
27 William Street
NEW YORK, N. Y.

PRODUCTS

Ethyl Alcohol (U. S. P., U. S. Government specifications and special grades for special uses)
Completely Denatured Alcohol (all formulas authorized by the U. S. Internal Revenue Bureau)
"Pyro" Alcohol
Specially Denatured Alcohol (all formulas authorized by the U. S. Internal Revenue Bureau).
C. P. Methanol
Pure Methanol
Commercial Acetone
"Calcitone"
Methyl Acetone
95% and 97% Refined Wood Alcohol
Denaturing Grades of Wood Alcohol

PRODUCT SPECIFICATIONS

ETHYL ALCOHOL, U. S. P.

ETHYL ALCOHOL, U. S. Government Specifications

ETHYL ALCOHOL, Special Grades for Special Uses

COMPLETELY DENATURED ALCOHOL

Completely denatured alcohol is ethyl alcohol rendered unfit for beverage purposes by the addition of material prescribed by the U S Internal Revenue Bureau Alcohol so denatured may be used without restrictions or regulations except as to marking of containers and is not subject to tax

Completely denatured alcohol formulas are as follows

Because of the confusion of **Methyl** and **Ethyl Alcohols** among laymen and the dangers involved we have decided to use the word alcohol only in connection with the ethyl and denatured alcohols and to indicate the grades of methyl alcohol by the **Methanol.**

Formula No. 1

This formula, which consisted of 100 parts of ethyl alcohol, 10 parts of methanol and ½ part benzine, has been suspended by the U S Bureau of Internal Revenue

Formula No. 2

100 gal ethyl alcohol
2 gal approved wood alcohol
½ gal approved pyridine

Formula No. 3

100 gal ethyl alcohol
5 gal. sulphuric ether
2 gal approved benzine
1 gal. approved pyridine

Formula No. 4

100 gal ethyl alcohol
2 5 gal. approved benzol
0 5 gal approved nitrobenzol
0 2 gal. pine oil (steam distilled)

Formula No. 5

100 gal ethyl alcohol
2 gal approved wood alcohol
¼ gal. approved pyridine bases
½ gal. approved benzine

Formula No. 6

100 gal ethyl alcohol
2 gal approved benzol
¼ gal approved pyridine bases
½ gal. approved benzine (kerosene)

"PYRO" ALCOHOL

This is a grade of denatured alcohol which has been denatured according to one of the above formulas for completely denatured alcohol In addition to passing Government inspection, the manufacture of this product has been very carefully controlled by skilled chemists resulting in a uniform product of very high quality.

SPECIALLY DENATURED ALCOHOL

Specially denatured alcohol is ethyl alcohol of 190° proof (95%) which has been partially denatured by the addition of materials prescribed by the U S Internal Revenue Bureau Alcohol so denatured may be used for the purposes authorized by and under the supervision of the U S Internal Revenue Bureau Such alcohol is not subject to tax but must be used under permit and bond Details of the procedure necessary in order to obtain authorization for use, permit and bond, etc, will be furnished by us upon request

Formula No. 1

100 gal. ethyl alcohol
5 gal approved methanol

Authorized Uses

Acetaldehyde
Acetphenetidine
Acetic ether
Aconite
Adeps lanæ
Alkaloids and alkaloidal salts
Alterin
Aloin
Antipyrine
Apocynin
Arbutin
Asclepiadin
Avenin
Artificial flowers
Ammunition
Atophan
Aspirin
Acetanilide
Artificial feathers

Baptisin
Barometer and thermometer tubes
Benzoic acid
Benzaldehyde
Beta-naphthol
Beta-naphthol benzoate
Brushes
Benzidine
Beta-naphthol salicylate
Benzyl cyanide
Benzoin

Chelonin
Cimicifugin
Collodion
Collodion corn remedy
Concentrations (non-liquid)
Confectioners' colors
Coumarin
Cutlery
Cocoa butter
Composition billiard and pocket balls
Chloroform
Compasses
Creosote carbonate
Colors and bronze powders
Chloral hydrate
Camphor, synthetic
Cements

Dental alloy
Dandelion and digitalis (Resin of, solid and powdered extracts of)
Disinfectant germicide
Door checks
Dyestuffs
Dimethylglyoxime
Dinitrotoluene
Digestive ferments
Diethylaniline

Ethyl acetate
Ethyl propionate
Ethyl butyrate
Essential oil orris
Ethyl chloride
Embalming fluid
Eosine
Ethyl bromide
Ether
Ethylaniline
Enamel
Extracting glycerine from distillery slop

Filaments for incandescent lamps
Formaldazone
Fertilizers
Fulminate of mercury
Formaldehyde

Gaduol
Gelatine capsules
Gentian (solid extract)
Glycerophosphates
Guaiacol
Guaiacol carbonate
Gum and pyroxylin solutions
Gallocyanine
Gas mantles

Hats
Heliotropin
Hydrastis (alkaloid of)
Hexachlorobenzol

Continued on Next Page

Inks
Inulin and irisein
Imitation leather
Isinglass
Imitation ivory goods

Jalapin (non liquid concentration of)
Jewelry and watches
Japans

Lacquers, pastes and varnishes from soluble cotton
Leather substitutes
Leather-goods finish
Lacquers
Liquor cresolis compound

Mandrake (powdered and solid extract of)
Mirrors
Moldings and picture frames
Monobromated camphor
Moth repellant
Mica insulators
Mucilage, paste, and glue
Motor fuel

Non-scatterable glass
Nitroso-beta-naphthol

Ortho-toluolsulphamide
Oils, greases, lubricants, and soluble thread-cutting oils
Oleoresins

Paints
Phenolphthalein
Phytolacin (concentration of)
Photographic dry plates and films
Print paper and enlargements
Postal-card colors
Polish preparations for metals and furniture
Pepsin and similar products
Potassium hydroxide
Podophyllin resin and similar products
Powdered drugs and extracts
Photographic engravings
Phenylcinchoninic acid
Pyroxylin cements

Refining mineral oils
Refining precious metals
Resin of scammony
Resorcin

Salol
Santonine and strychnine
Solid extracts
Soaps (transparent and liquid)
Shellac varnish
Shoe polish
Silverware and bronze
Smokeless powder
Surgical ligatures
Soldering flux
Sodium benzoate
Sulphonic acid and paraffine
Salicylic aldehyde
Solution and solvent of nitrocellulose
Solidified alcohol
Salophen
Saponin
Salicylic acid
Saccharine
Shellac thinner
Stains
Sterilizing solution for corks
Silk fabrics
Synthetic mustard oil
Shampoo, liquid
Shampoo, jelly
Stencil paper

Tannic acid
Tinfoil and bottle caps
Terpin hydrate
Textile cleansing soap
Toluidine
Transparent paper
Transparent soap for waterproofing cement
Trinitrotoluol
Theobromine
Thermostatic devices

Varnish remover
Viburnum (concentration)

Water colors
Wood finish
Wool fat
Washing lenses
Wood filler
Watches

Formula No. 2
100 gal ethyl alcohol
7 lb camphor
5 gal methanol (refined)

Authorized Uses: Pyraline and similar products

Formula No. 2a
100 gal ethyl alcohol
2 gal approved methanol
2 gal benzol

Authorized Uses: Celluloid, pyraline and similar products

Formula No. 2b
100 gal ethyl alcohol
½ gal benzol

Authorized Uses: Acetic ether, acetphenetidine (conditional), dyes, diethyl barbituric acid (barbital), ethyl sulphate (for use in manufacture of acetphenetidine); phenacetine; pyroxline plastics, ketone, Michler's; sulphuric ether (in connection with the production of powder), synthetic camphor, trinitrotoluol, viscaloid, white petroleum oils; ethyl sulphate

Formula No. 3
100 gal ethyl alcohol
6½ gal following mixture: 5 gal methanol (refined), 1 gal castor oil, ½ gal of 36 deg. Bé caustic soda lye

Authorized Uses: Transparent soap; shampoo; shampoo jelly.

Formula No 3a
100 gal ethyl alcohol
5 gal methanol (refined)

Authorized Uses: Cutting oils, shampoo, shampoo jelly, transparent soap

Formula No 3b
100 gal ethyl alcohol
1 gal liquid pine tar

Authorized Uses: Liquid soap, shampoo, shampoo jelly

Formula No 4
100 gal ethyl alcohol
1 gal following solution: 5 gal aqueous solution containing 40 per cent nicotine, 0.4 lb acid yellow dye (fast yellow Y), 0.4 lb tetrazo brilliant blue 12B, conc., water to make 100 gal
100 gal ethyl alcohol
1 gal following solution: 5 gal aqueous solution containing 40 per cent nicotine, 36 oz more or less, of methylene blue, water to make 100 gal
(This is an alternative for formula 4 above)

Authorized Uses: Cigars, cigarettes, smoking, chewing tobacco, deodorants

Formula No 5
100 gal ethyl alcohol
65 lb sulphuric ether
3 lb cadmium iodide
3 lb ammonium iodide

Authorized Uses: Photo enlargements, photoprints, photo-engravings, photographic collodion

Formula No 6
100 gal ethyl alcohol
3 gal methanol (refined)
½ gal pyridine bases

Authorized Use: Fulminate of mercury

Formula No. 6a
100 gal ethyl alcohol
15 gal condensed fumes, recovered in the process of manufacture (Fulminate of mercury)

Authorized Use: Fulminate of mercury

Formula No. 6b
100 gal ethyl alcohol
½ gal pyridine bases

Authorized Uses: Acetphenetidine, chloral hydrate, dichloroethane, ethyl acetate, ethyl butyrate, ethyl chloride, para-fulminate of mercury, para phenetidine, acetic ether, ethyl bromide

Formula No. 7
Revoked (formula 1 substituted)

Authorized Use: Revoked

Formula No 8
100 gal ethyl alcohol
1 gal pyridine bases
1 gal benzol

Authorized Use: Ethyl chloride, fine chemicals; sulphonemethane, dyes

Formula No. 9
100 gal ethyl alcohol
10 gal acetone
2 gal petroleum naphtha

Authorized Uses: Monobromated camphor, purification of rubber, santonin, strychnine, tannic acid

Formula No. 10
100 gal ethyl alcohol
2 gal approved methanol
2 gal benzol

Authorized Uses: Ethyl acetate (conditional), lacquers, pastes and varnishes from soluble cotton

Formula No 11
100 gal ethyl alcohol
100 lb sulphuric ether
10 lb cadmium iodide

Authorized Uses: Photographic collodion, photo-engraving, photoprints

Formula No. 12
100 gal ethyl alcohol
1 gal pyridine bases
2 gal benzol

Authorized Uses: Imitation leather (see also formula 12a); soluble cotton.

Continued on Next Page

Formula No. 12a

100 gal ethyl alcohol
5 gal benzol

Authorized Uses: Acetphenetidine, barbital, hydr zoanisol, imitation leather, milk protein, para-nitrophenetol, refining potassium and sodium hydrates, saponification of the waxes of acid fast bacteria, smokeless powder, terpin hydrate, trinitrotoluol, benzoic acid ethyl ester, dye intermediates, imitation rubber

Formula No 13

100 gal ethyl alcohol
5 gal sulphuric acid
5 gal sulphuric ether

Authorized Use: Sulphuric ether (See also formula 13a)

Formula No 13a

100 gal ethyl alcohol
10 gal sulphuric ether

Authorized Uses: Celery oil, certified food colors, dry extracts for food products, ethereal oil, protargentum, sodium ethyl sulphate, sulphuric ether

Formula No. 14

100 gal ethyl alcohol
5 gal methanol (refined)
10 lb anhydrous zinc chloride

Authorized Use: Ethyl chloride (See also formulas 1 and 8)

Formula No. 15

100 gal ethyl alcohol
3 gal sulphuric acid
1 gal kerosene

Authorized Uses: Ethyl bromide, ethyl chloride, nitrous ether, pure acetic ether

Formula No 16

100 gal ethyl alcohol
5 gal methanol (refined)
2 gal benzol

Authorized Uses: Beta-naphthol, by-products from distillery slop, glycerophosphates, lacquers for food containers, phenylcinchonic acid, acetanilide, acid salicylic, acetphenetidine ammonium, benzonaphthol, beta naphthol benzoate, codeine, diacetylmorphine, ethyl morphine, homatropine, morphine salicylate, cocaine, sodium, strontium, salol (See also formula 1)

Formula No. 17

100 gal ethyl alcohol
5/100 gal (6½ fluid oz) animal oil (Dippel's oil)

Authorized Uses: Acetphenetidine, chloral hydrate, dichlorethane, ethyl acetate, ethyl chloride, ethylene gas, paraphenetidine

Formula No. 18

100 gal ethyl alcohol
100 gal vinegar (not less than 9 per cent acetic acid)

Authorized Uses: Acetate of lime, acetone; vinegar

Formula No. 19

100 gal ethyl alcohol
100 gal ethyl ether

Authorized Uses: Artificial silk, backing of films, by-products from distillery slop (See also formula 16) Collodion, ethyl acetate, iodizers, solvent for nitrocellulose, photofilms, photo engravings

Formula No. 19a

100 gal ethyl alcohol
not less than 100 gal ethyl ether or more than 150 gal ethyl ether (Sp gr at 60°F 0.728)

Authorized Uses: Artificial silk in connection with collodion (conditional)

Formula No. 20

100 gal ethyl alcohol
5 gal crude chloroform

Authorized Use: Chloroform (conditional).

Formula No. 21

100 gal ethyl alcohol
100 gal solution containing not less than 4½ per cent acetic acid

Authorized Use: Acetate of lime (conditional)

Formula No. 22

100 gal ethyl alcohol
10 gal solution of formaldehyde

Authorized Use: For preserving formaldehyde, U. S P

Formula No. 23

100 gal ethyl alcohol
10 gal acetone
2 gal benzol

Authorized Use: Liniment for external use only

Formula No 23a

100 gal ethyl alcohol
10 gal acetone, U S P

Authorized Uses: Liniments and lotions for external purposes

Formula No. 23b

100 gal ethyl alcohol
15 lb camphor, U S P
2 lb menthol crystals, U S P
3 lb carbolic acid, U S P

Authorized Uses: Lotions for external purposes only.

Formula No. 23c

100 gal ethyl alcohol
10 lb carbolic acid, U S P
15 lb resorcinol, U S P
5 lb oil of wintergreen, U S P or methyl salicylate, U S P

Authorized Uses: Lotions for external purposes only.

Formula No 24

100 gal ethyl alcohol
29 gal sulphuric acid

Authorized Uses. Phenacetin, ethyl acetate (conditional), ethyl butyrate, ethyl propionate, ethyl valerate

Formula No. 25

100 gal ethyl alcohol
20 lbs iodine
15 lbs potassium iodide, U S P

Authorized Uses: Tincture of iodine, U S P, Tr iodi fortior, N F, tr iodine, Churchill's, tr iodine, 3½%

Formula No. 26

100 gal ethyl alcohol
5 gal aniline oil

Authorized Uses: Ethylaniline and diethylaniline

Formula No. 27

100 gal ethyl alcohol
1 gal oil rosemary
30 lb camphor

Authorized Uses: Soap liniment, U S P, chloroform liniment, U S P, liquid and green soap, in accordance with U S P except as to content of camphor and oil of rosemary

Formula No. 27a

100 gal ethyl alcohol
35 lb camphor, U S P
1 gal oil cloves, U S P

Authorized Uses: Same as for Formula 27.

Formula No. 28

100 gal ethyl alcohol
10 gal benzol

Authorized Use: Motor fuel (conditional).

Formula No. 20

100 gal ethyl alcohol
5 gal alcoholic solution acetaldehyde

Authorized Uses: Aldehydes (conditional); glacial acetic acid (conditional).

Continued on Next Page

Formula No. 30
100 gal ethyl alcohol
10 gal. methanol (refined)

Authorized Uses: Chemical and physical laboratory purposes, only in accordance with the provision of T. D. 2793 (no recovery for re-use), photo dry plates manufacturing vegetable oils, varnish, white petroleum oils (conditional)

Formula No. 31
100 gal ethyl alcohol
100 lb soap
100 lb glycerine, U S P

Authorized Use: Tooth paste

Formula No. 31a
100 gal ethyl alcohol
100 lb glycerine
20 lb hard soap

Authorized Use: Tooth paste.

Formula No. 31b
100 gal ethyl alcohol
5½ gal oil peppermint
1¼ gal eucalyptol
4 lb menthol crystals

Authorized Use: Tooth paste

Formula No. 31c
100 gal ethyl alcohol
33 lb citric acid, U S P
33 lb menthol, U S P

Authorized Uses: Tooth paste

Formula No. 32
100 gal ethyl alcohol
5 gal sulphuric ether

Authorized Use: Ethylene (conditional)

Formula No. 33
(33) 100 gal ethyl alcohol
30 lb methyl violet

Authorized Use: Meat branding inks (conditional).

Formula No. 34
100 gal ethyl alcohol
5 gal tetrachloroethane

Authorized Uses: Artificial silk

Formula No. 35
100 gal ethyl alcohol
35 gal ethyl acetate

Authorized Uses: Acet-para-amidophenol, salol

Formula No. 36
100 gal ethyl alcohol
3 gal stronger ammonia water, U S P

Authorized Uses: Shaving cream

Formula No. 37
100 gal ethyl alcohol
45 oz eucalyptol, U S P
30 oz thymol, U S P
20 oz menthol, U S P

Authorized Uses: Antiseptic solutions for external purposes

Formula No. 38
100 gal ethyl alcohol
10 lb oil of wintergreen, U S P, or methyl salicylate, U S P, or oil of cassia, U S P, or oil of cloves, U S P, or oil of peppermint
5 gal of a water solution of 60 oz zinc chloride, U S P.

Authorized Uses: Mouth washes and dentifrices

Formula No. 38a
100 gal ethyl alcohol
5 oz menthol crystals, U S P
9 oz emetine hydrochloride, U S. P.
16 lb benzoic acid, U. S. P.

Authorized Uses: Liquid dentifrices.

Formula No 39
100 gal ethyl alcohol
9 lb (Avoir) sodium salicylate, U S P
1¼ gal fluid extract quassia, U S P
1 gal acetone U S P

Authorized Uses: Barber's supply preparations

Formula No. 39a
100 gal ethyl alcohol
60 oz (Avoir) of any one of the following U S P alkaloids or salts, quinine, quinine bisulphate, quinine hydrochloride, cinchonidine, cinchonidine sulphate
1 gal acetone, U S P

Authorized Uses: Barber's supply preparations

Formula No. 40
100 gal ethyl alcohol
3 oz (Avoir) brucine sulphate
½ gal acetone, U S P

Authorized Uses Perfumes and high grade toilet preparations

The types and quality of denaturing materials used in the formulas given are controlled by the U S Internal Revenue Bureau, and the details as to their specifications will be supplied upon request

THE FOLLOWING PRODUCTS ARE MANUFACTURED AT OUR PLANT IN BUFFALO, NEW YORK.

C. P. Methanol
Free from Acetone

Pure Methanol
Practically free from water, guaranteed to contain less than 0 1% acetone, specific gravity 0 795 Used in the manufacture of formaldehyde, dimethylaniline, methyl salicylate, etc

Commercial Acetone
80 90% true acetone, odor, specific gravity, etc, practically the same as pure acetone

"Calcitone"
Free from water, containing 50 60% methyl acetate, about 20% acetone A fine solvent for cellulose acetate

Methyl Acetone
Free from water, guaranteed to contain 70 80% combined acetone and methyl acetate

95–97% Refined Wood Alcohol

Denaturing Grades of Wood Alcohol
For all countries

Our Buffalo plant is the result of a great many years spent in research and refinement in methods and apparatus for the production of those products derived from the destructive distillation of wood.

Because of the confusion of **Methyl** and **Ethyl Alcohols** among laymen and the dangers involved we have decided to use the word alcohol only in connection with the ethyl and denatured alcohols and to indicate the grades of methyl alcohol by the term Methanol.

Careful consideration has been given to the separation of acetone from the methanol and attention is called to the two grades indicated as C. P. Methanol and Pure Methanol. Particular attention is given to requests for denaturing grades of methanol which may be required by different countries.

U. S. INDUSTRIAL CHEMICAL CO.

EXECUTIVE OFFICES
27 William Street
NEW YORK, N. Y.

PRODUCTS

- Acetic Ether
- Ammonia Salts
- Amyl Acetate
- Amyl Alcohol
- Carbon Dioxide
- Denatured Alcohol
- Ether
- Ethyl Acetate
- Ethyl Acetoacetate (Acetoacetic Ester)
- Ethyl Alcohol
- Ethylene
- Fertilizers, Mixed
- Iodine
- Iodine, Tincture of
- Isobutyl Alcohol
- Fusel Oil
- Methyl Acetate
- Methyl Alcohol
- Potash Materials
- Potassium Iodide
- Propyl Alcohol

PRODUCT SPECIFICATIONS

ACETIC ETHER, ANHYDROUS

Weight: 7.5 lb per gallon at 60°F
Saponification: 99%
Acidity (as Acetic): Not more than 0.01%
Containers: Tank cars 8000 gallons
50 or 100-gallon steel drums

ALCOHOL, AMYL, COMMERCIAL

Specific Gravity: 0.813-0.815
Boiling-range: 126°-132°C
Weight: 6.78 lb per gallon at 60°F
Containers: 50 and 100-gallon iron drums

ALCOHOL, AMYL, REFINED

Weight: 6.78 lb per gallon
Specific Gravity: 0.813-0.815
Boiling-range: 128°-132°C
Containers: 5 or 10-gallon pressed steel tinned drums
½-liter bottles, 36 bottles to the case

ALCOHOL, ETHYL, PURE 96%

Weight: 6.763 lb per gallon at 60°F
Containers: 50-gallon steel tin-lined drums
5 or 10-gallon pressed steel tinned drums
½-liter bottles, 36 bottles to the case

ALCOHOL, ETHYL, ABSOLUTE

C_2H_5OH: 99.7 to 100%
Weight: 6.62 lb per gallon at 60°F
Containers: Steel drums tin-lined, 5, 10 and 50 gallons

ALCOHOL, ETHYL, ABSOLUTE, 99.9%

Weight: 6.616 lb per gallon at 60°F
Containers: 50 gallon steel tin-lined drums
5 or 10-gallon pressed steel tinned drums
½-liter bottles, 36 bottles to the case

ALCOHOL, ETHYL, ABSOLUTE, DENATURED

Absolute Alcohol may be obtained for use in manufacturing processes, tax-free, when denatured according to formulas authorized and approved by the U S Internal Revenue Bureau.

ALCOHOL, ISOBUTYL

Weight: 6.72 lb per gallon
Boiling-range: 101°-109°C
Containers: 50 or 100-gallon steel drums

ALCOHOL, ISOBUTYL—REFINED

Weight: 6.72 lb per gallon
Specific Gravity: 0.807
Boiling-range: 106°-108°C
Containers: 5 or 10-gallon pressed steel tinned drums
½-liter bottles, 36 bottles to the case

ALCOHOL, METHYL, ABSOLUTE

CH_3OH: 99.5 to 100%
Weight: 6.633 lb per gallon at 60°F
Acetone: None
Containers: 5 and 10-gallon pressed steel tinned drums
50 gallon steel drums
½-liter bottles, 36 bottles to the case

ALCOHOL, NORMAL PROPYL—COMMERCIAL

Boiling-range: 90°-101°C
Weight: 6.75 lb per gallon at 60°F
Containers: 50 and 100-gallon iron drums

ALCOHOL, NORMAL PROPYL, REFINED

Weight: 6.74 lb per gallon
Specific Gravity: 0.809
Boiling-range: 96°-98°C
Containers: 5 or 10-gallon pressed steel tinned drums
½-liter bottles, 36 bottles to the case

AMMONIA SALTS

Derived from distillery waste
Sulfate of Ammonia
A mixture of Ammonia and Potash Salts
Shipped in 200-lb bags

AMYL ACETATE, COMMERCIAL

Weight: 7.17 lb per gallon
Saponification (as Amyl Acetate): 85%
Containers: Tank cars—8000 gallons
50 or 100-gallon steel drums

AMYL ACETATE, REFINED

Weight: 7.30 lb per gallon
Ester (calculated as Amyl Acetate): 99%
Acidity (as Acetic): Not over 0.01%
Specific Gravity: 0.876-0.878
Containers: 5 and 10-gallon pressed steel tinned drums
½-liter bottles, 36 bottles to the case

CARBON DIOXIDE

CO_2: Not less than 99.8%
Containers: Steel cylinders Gross weight about 15 lb
Net weight 3 lb (about 25 cu ft)

ETHER FOR ANESTHESIA

Derived from Ethyl Alcohol
Purified especially for Anesthesia
Weight: 6.01 lb per gallon at 60°F

Aldehydes ....none
Peroxides . . .. .none
Sulfur Acids . ... none
Organic Acids . . .. none
Oxidizable Impurities (Permanganate Test)—None
Residue on Evaporation.........not weighable

Containers: One-pound cans, 12 cans to the corrugated paper ICC case
Quarter-pound cans, 24 cans to the corrugated paper ICC case

Continued on Next Page

ETHER, COMMERCIAL

Not less than 96% $(C_2H_5)_2O$
Weight: 6.0 lb per gallon at 60°F
Containers: 50-gallon tin lined drums

ETHER, ETHYL, ABSOLUTE

Derived from Ethyl Alcohol
Weight: 5.996 lb per gallon at 60°F
Distilled over sodium
Specially purified for use in Grignard reaction
Containers: Five-gallon pressed steel tinned drums
One-pound cans, 12 cans to the corrugated paper ICC case

ETHER, ETHYL, U. S. P.

Derived from Ethyl Alcohol
Weight: 6.01 lb per gallon at 60°F
Conforms to requirements of U. S. Pharmacopeia, IX
Containers: 5, 10 and 50-gallon pressed steel tinned drums
One-pound cans, 12 cans to the corrugated paper ICC case

ETHYL ACETATE, ANHYDROUS

Weight: 7.5 lb per gallon at 60°F
Specific Gravity: 0.905 to 0.907
Boiling-point: 76°-78°C
Ester: 99.7-100%
Containers: 5 or 10-gallon pressed steel tinned drums
½-liter bottles, 36 bottles to the case

ETHYL ACETATE, COMMERCIAL

Weight: 7.44 lb per gallon at 60°F
Saponification (Ester) Not less than 85%
Acidity (calc. as Acetic) Not more than 0.01%
Water: None
Color: Water white
Containers: Tank cars—8000 gallons
50 or 100-gallon steel drums

ETHYL ACETOACETATE, REFINED

Specific Gravity: 1.032 to 1.035
Boiling-point at 20 mm.: 79°-84°C
Weight: 8.6 lb per gallon at 60°F
Containers: ½ liter bottles, 36 bottles to the case
2 and 5-gallon glass carboys

ETHYL ACETOACETATE, COMMERCIAL

Weight: 8.6 lb per gallon at 60°F
Specific Gravity: 1.030 to 1.035
Boiling-point at 20 mm.: 79°-84°C
Containers: Pressed steel tinned drums, 85 lb (about 10 gal.)

ETHYLENE

C_2H_4 not less than 99.5%
Containers: Steel cylinders. Gross weight about 15 lb. Net weight 2 lb

FERTILIZERS, MIXED

Special formulas
Mixed according to order
Shipped in 100, 125, 167 and 200-lb bags

FUSEL OIL NO. 80—REFINDD

Weight: 6.75 lb per gal
60% distils above 115°C
Containers: Tank cars—8000 gallons
50 or 100-gallon steel drums

FUSEL OIL NO. 71, REFINED

Weight: 6.78 lb per gallon
70% distils above 120°C
Neutral
Color: Water white
Containers: Tank cars—8000 gallons
50 or 100-gallon steel drums

IODINE, DISTILLED

Iodine 99.9% to 100%
Free from Chlorine, Bromine, Mineral Residue and Organic Matter
Containers: One pound glass stoppered bottles, 12 bottles to the corrugated paper ICC case
Five pound glass stoppered bottle, four bottles to the corrugated paper ICC case

IODINE, TINCTURE OF (Special)

Made from distilled Iodine
Quality superior to requirements of U. S. P. IX
Containers. 16 fluid ounce glass stoppered amber bottles, 12 bottles to the corrugated paper ICC case

METHYL ACETATE—ANHYDROUS

Weight: 7.83 lb per gallon at 60°F
Specific Gravity: 0.938 to 0.942
Boiling-point: 56°-58°C
Ester: 99.5-100%
Containers: 5 or 10 gallon pressed steel tinned drums
½ liter bottles, 36 bottles to the case

METHYL ACETATE, COMMERCIAL

Weight: 7.5 lb per gallon
Saponification (as Methyl Acetate) 80%
Acidity (as Acetic) Not more than 0.1%
Specific Gravity at 60°/60°F not less than 0.900

POTASH MATERIALS

Derived from distillery waste
I. C. Ash approximately 35% K_2O
Sulfate of Potash
Muriate of Potash
Carbonate of Potash
Shipped in 200-lb bags

POTASSIUM IODIDE

Conforms to requirements of U. S. P. IX
Containers: 4-oz bottles, 36 bottles to the corrugated paper ICC case
24-oz bottles, 12 bottles to the corrugated paper ICC case

ESTERS

The following are special esters which we are prepared to make on order. About ten days required:

Diethyl Carbonate

Ethyl Benzoate
Ethyl Butyrate
Ethyl Cyanide
Ethyl Formate
Ethyl Fumarate
Ethyl Isovalerate
Ethyl Lactate
Ethyl Malate
Ethyl Maleate
Ethyl Monochloroacetate
Ethyl Oxalate
Ethyl Propionate
Ethyl Salicylate

Isoamyl Acetate
Isoamyl Formate
Isoamyl Isovalerate
Isoamyl Propionate

Isobutyl Acetate
Isobutyl Butyrate
Isobutyl Formate
Isobutyl Isovalerate
Isobutyl Propionate

Isopropyl Oxalate

Methyl Formate

Normal Propyl Acetate
Normal Propyl Isovalerate
Normal Propyl n-Butyrate
Normal Propyl Propionate

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SOLE SELLING AGENT FOR

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The Nitro Products Corporation
Nitro, W. Va.

The Uniform Color & Chemical Co., Inc.
Perth Amboy, N. J.
The T. M. & G. Chemical Co.
Belleville, N. J.

Thatcher Process Co.
Syracuse, N. Y.

PRODUCTS

- Aniline Oil
- Anthraquinone
- Benzidine Base
- Benzidine Sulfate
- Carbazole
- Diethylaniline
- Ethylbenzylaniline
- H Acid
- Monoethylaniline
- Nitrobenzol
- Thiocarbanilide

ANILINE OIL $C_6H_5NH_2$

Our aniline is scientifically made, thoroughly rectified, is pure in composition and pale in color.

Physical constants: Specific gravity 1.0235, melting-point 5.96°C.; boiling-point 184.4°C.

Shipping containers: Iron drums.

Uses: Manufacture of dyestuffs and intermediates, organic synthesis; rubber industry, solvent.

ANTHRAQUINONE $C_6H_4(CO)_2C_6H_4$

Produced by the Thatcher process, yielding an exceedingly pure product, eminently suited for dyestuff manufacture.

Physical constants: Specific gravity 1.419-1.438, melting-point 284.6°C.

Shipping containers: Wooden barrels.

Uses: Manufacture of intermediates for the production of alizarin, anthraquinone and quinazarin dyestuffs; indigo discharge.

BENZIDINE BASE $C_6H_4NH_2.NH_2H_4C_6$

Produced from our own nitrobenzol and redistilled, we are able to fully guarantee the purity and uniformity of the product.

Grades: Dry (Recrystallized); Paste.

Physical constants (Dry): Melting-point 127°C.; boiling-point 400°C.

Shipping containers: Wooden kegs or barrels (50, 100 and 200 lb.).

Uses: Manufacture of dyestuffs, particularly Congo red and azo dyes for cotton; organic synthesis.

BENZIDINE SULFATE $(C_6H_4NH_2)_2.H_2SO_4$

A high grade product produced from raw materials of our own manufacture. Recrystallized, and of guaranteed purity. In paste form only.

Shipping containers: Wooden kegs or barrels (50 and 100 lb.).

Uses: Production of benzidine base, manufacture of dyestuffs; organic synthesis.

CARBAZOLE $(C_6H_4)_2NH$

A high grade product free from anthracene and phenanthrene.

Physical constants: Melting-point 238°C.

Shipping containers: Wooden barrels.

Uses: Manufacture of dyestuffs, organic synthesis.

DIETHYLANILINE $(C_2H_5)_2NC_6H_5$

Fully rectified, and free from unconverted aniline and other impurities. Never darkens on standing.

Physical constants: Specific gravity 0.9351, melting-point 38° to 39°C., boiling-point 213.5°C.

Shipping containers: Iron drums.

Uses: Organic synthesis, manufacture of dyestuffs.

ETHYLBENZYLANILINE $C_6H_5N(C_2H_5)CH_2C_6H_5$

A clear, colorless oil, free from unconverted raw materials and impurities.

Physical constants: Specific gravity 1.034, boiling point 286°C.

Shipping containers: Iron drums.

Uses: Manufacture of dyestuffs, organic synthesis.

H ACID $C_{10}H_4(OH)(NH_2)(SO_3H)_2$

Produced by scientifically established methods under constant and efficient supervision.

Grade: Powder, sold on a basis of 100 per cent., calculated on a molecular weight of 341.

Shipping containers: Wooden barrels.

Uses: Manufacture of azo dyestuffs.

MONOETHYLANILINE $C_2H_5NHC_6H_5$

We produce ethylaniline as a colorless liquid, so pure that it does not darken materially on standing.

Physical constants: Specific gravity 0.9631, melting-point 80°C., boiling-point 206°C.

Shipping containers: Iron drums.

Uses: Manufacture of dyestuffs, organic synthesis.

NITROBENZOL $C_6H_5NO_2$

A properly nitrated product, free from impurities. Our redistilled grade is absolutely free from all unconverted benzol, and distils completely within a range of 2 degrees.

Physical constants: Specific gravity 1.19867, melting-point 8.70°C., boiling-point 210.85°C.

Shipping containers: Iron drums.

Uses: Production of aniline, benzidine, quinoline, azobenzene, etc., in perfumery as a substitute for essential oil of almonds; production of dust preventives.

THIOCARBANILIDE $CS(NHC_6H_5)_2$

A pure, colorless, crystalline product.

Grades: Powder, Leaflets.

Physical constants: Specific gravity 1.3205; melting-point 151°-154°C.

Shipping containers: Wooden barrels.

Uses: Vulcanization accelerator in the rubber industry; organic synthesis.

ANTHRACENE OIL PRODUCTS

We are in a position to furnish Phenanthrene and other intermediates derived from anthracene oil at short notice.

VICTOR CHEMICAL WORKS

FISHER BUILDING, CHICAGO, ILL.

Cable Address
"VICTACID" Chicago

Trade Mark

FACTORIES
Chicago Heights, Ill
Nashville, Tenn

BRANCH OFFICES
New York, N Y 95 Liberty St
St Louis Mo Pierce Bldg
Nashville Tenn 4th & 1st National Bank Bldg

PRODUCTS

Manufacturers of

Oxalic Acid, 99.8% pure
Crystals and Powdered

Formic Acid
All Strengths

Sulphuric Acid, 60° Bé.

Phosphoric Acid

Phosphoric Acid Paste

Ammonium Phosphate

Baking Powder Chemicals

Phosphates
- Mono-Calcium
- Di-Calcium
- Tri-Calcium
- Mono-Sodium
- Pyro-Sodium

Epsom Salt
- U S P.
- Technical

Niter Cake

Paper Filler

Miscellaneous
- Bicarbonate of Soda
- Sodium-Aluminum Sulphate
- Sodium Sulphate
- Nickel Formate
- Sodium Formate

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Established 1886

Manufacturers

52 VANDERBILT AVE., NEW YORK, N. Y.

PLANTS Carteret, N. J. South Charleston, W. Va.

Cable Address
"CAUSTIC", New York
Codes
ABC, 5th Edition
Lieber's

PRODUCTS

Phosphates, Chlorine Products and other Chemicals, all of our own manufacture.

ACETIC ANHYDRIDE, 90%
Uses: Pharmaceuticals, dyestuffs, cellulose acetate
In carboys 100 lb net, 180 lb gross, measurements 33" x 21" x 19", capacity 5.3 cu. ft.

ACETYL CHLORIDE
Uses: Pharmaceuticals, perfumes
In carboys 100 lb. net, 180 lb gross, measurements: 33" x 21" x 19"; capacity 5.3 cu. ft.

ACID PHOSPHORIC, 50%, SP. GR. 1.400
Uses: Soft drinks, jellies and other food products, matches, etc.
Lead and arsenic-free
In carboys 140 lb. net, 220 lb. gross; measurements: 33" x 21" x 19"; capacity 5.3 cu. ft.

ALUMINUM HYDRATE, LIGHT, POWDER, 96%
Uses: Printing inks, varnishes, oil-cloth manufacture
In barrels 90 lb. net, 113 lb gross, measurements 24" x 24" x 30", capacity 10 cu. ft.

ALUMINUM HYDRATE, LIGHT, LUMPS, 96%
Uses Printing inks, varnishes, etc
In barrels 100 lb. net, 123 lb gross, measurements: 24" x 24" x 30", capacity. 10 cu. ft

CARBON DISULFIDE, REDISTILLED
Uses: Rubber solvent, insecticide, etc.
In 5, 10 and 55 gallon drums, measurements: 5 gal.: 10" x 10" x 17"; capacity 0.98 cu ft, 10 gal: 14" x 14" x 21", capacity 2.4 cu ft, 55 gal. 25¼" x 25¼" x 36", capacity 13.3 cu. ft.

CARBON TETRACHLORIDE
Uses Non-inflammable solvent, cleaner, fire extinguisher
In 5, 10, 55 and 110 gallon drums; measurements 5 gal.: 10" x 10" x 17"; capacity: 0.98 cu. ft., 10 gal.: 14" x 14" x 21"; capacity: 2.4 cu ft.; 55 gal.: 25¼" x 25¼" x 36"; capacity: 13.3 cu. ft.; 110 gal.: 32" x 32" x 42¾"; capacity 25.3 cu. ft.

CARBON TETRACHLORIDE FLUID
Freezing-point −50° F.
Uses: For fire extinguishers
In 5, 10, 55 and 110 gallon drums; measurements: As above

PHOSPHORUS OXYCHLORIDE
Uses: Pharmaceutical and technical manufacture
In steel-jacketed lead cylinders: 200 lb. net, tare 185 lb.; measurements: 21" x 21" x 29"; capacity: 7.4 cu. ft.; 650 lb. net, tare 300 lb.; measurements: 25¼" x 25¼" x 36"; capacity: 13.3 cu. ft.

PHOSPHORUS TRICHLORIDE
Uses: Pharmaceutical and technical manufacture
In steel-jacketed lead cylinders, 200 lb. net, tare 185 lb., and 650 lb. net, tare 300 lb.; measurements: As above

SODA, CAUSTIC, LIQUID, 33% Na_2O
In tank cars and drums

SODA, CAUSTIC, SOLID FUSED, 76%–78% Na_2O
In drums 700 lb net, 720 lb gross, measurements: 21½" x 21½" x 31½", capacity: 8.4 cu. ft.

SODIUM HYPOCHLORITE SOLUTION
Uses Principally as a bleach for panama hats, high grade fabrics, etc., also in the manufacture of pharmaceutical chemicals
In carboys 100 lb. net, 180 lb gross, measurements: 33" x 21" x 19"; capacity 5.3 cu. ft.

SODIUM PHOSPHATE, MONOBASIC; PHARMACEUTICAL
Uses Manufacture of pharmaceutical products, especially effervescent salts
In barrels 400 lb. net, 425 lb gross, measurements: 24" x 24" x 30"; capacity 10 cu ft.

SODIUM PHOSPHATE, MONOBASIC, "PYRO"
Uses As cream of tartar substitute in metal plating
In barrels 500 lb net, 525 lb gross, measurements: 24" x 24" x 30", capacity 10 cu. ft.

SODIUM PHOSPHATE, DIBASIC; ANHYDROUS U. S. P.
Uses: Medicinal, and in the manufacture of dyestuffs
In barrels 300 lb net, 318 lb. gross, measurements: 22" x 22" x 29"; capacity 8.1 cu. ft.

SODIUM PHOSPHATE, DIBASIC; GRANULAR U. S. P.
Uses Medicinal
In barrels 250 lb net, 270 lb gross; measurements: 22" x 22" x 29"; capacity 8.1 cu. ft.

SODIUM PHOSPHATE, TRIBASIC
Uses Water softener, boiler compounds, laundries
In barrels 500 lb. net, 530 lb. gross, measurements 27" x 27" x 34", capacity 14.3 cu. ft.; 360 lb net, 385 lb. gross, measurements. 24" x 24" x 30", capacity 10 cu ft
In kegs. 150 lb net, 162 lb gross; measurements: 17" x 17" x 24", capacity. 4.0 cu ft., 100 lb. net, 110 lb. gross, measurements: 15¼" x 15¼" x 20", capacity. 2.7 cu. ft

"SNOWHITE"
Uses Water softener, soap substitute for laundries, dairies, hotels, hospitals, etc
In barrels 360 lb. net, 385 lb gross; measurements: 24" x 24" x 30", capacity: 10 cu. ft.
Also in kegs as above

SULFUR CHLORIDE, YELLOW AND RED
Uses: Manufacture of rubber substitutes and in vulcanizing rubber
In bottles, jugs and drums

INFORMATION

Prices and all other information desired will be cheerfully furnished on request

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H ACID $C_{10}H_4(OH)(NH_2)(SO_3H)_2$

Produced by scientifically established methods under constant and efficient supervision.

Grade: Powder, sold on a basis of 100 per cent, calculated on a molecular weight of 341.

Shipping containers: Wooden barrels.

Uses: Manufacture of azo dyestuffs.

MONOETHYLANILINE $C_2H_5NHC_6H_5$

We produce ethylaniline as a colorless liquid, so pure that it does not darken materially on standing.

Physical constants: Specific gravity 0.9631, melting-point 80°C., boiling-point 206°C.

Shipping containers: Iron drums.

Uses: Manufacture of dyestuffs, organic synthesis.

NITROBENZOL $C_6H_5NO_2$

A properly nitrated product, free from impurities. Our redistilled grade is absolutely free from all unconverted benzol, and distils completely within a range of 2 degrees.

Physical constants: Specific gravity 1.19867, melting-point 8.70°C., boiling-point 210.85°C.

Shipping containers: Iron drums.

Uses: Production of aniline, benzidine, quinoline, azobenzene, etc., in perfumery as a substitute for essential oil of almonds; production of dust preventives.

THIOCARBANILIDE $CS(NHC_6H_5)_2$

A pure, colorless, crystalline product.

Grades: Powder, Leaflets.

Physical constants: Specific gravity 1.3205; melting-point 151°-154°C.

Shipping containers: Wooden barrels.

Uses: Vulcanization accelerator in the rubber industry; organic synthesis.

ANTHRACENE OIL PRODUCTS

We are in a position to furnish Phenanthrene and other intermediates derived from anthracene oil at short notice.

WILSON & CO.

WILSON & CO.
Trade Mark

1100 S. Ashland Ave.
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Cable Address
"WILSON" Chicago

PRODUCTS

- **Blood: Dried, Ground.**
- **Bones: Various Grades and Kinds**
- **Bone Meal**
- **Gelatines**
- **Glues**
- **Greases: White and Yellow**
- **Hide Trimmings: Calf-skin and Cattle**
- **Hoofs: Cattle; Black and White**
- **Hoof Meal**
- **Horns: Cattle**
- **Oil: Lard, Neatsfoot, and Tallow**
- **Oleostearin**
- **Sinews: Green, Salted**
- **Tallow**
- **Tankage: Ground, Protein**

BONE MEAL

A uniform, finely ground powder, free from lumps and foreign matter; of particular interest in the ingot casting and case-hardening operations in metallurgy

LARD OIL

Grades:

- Prime Winter, Strained. FFA under 2 per cent
- Extra Winter, Strained. FFA 2 to 4 per cent
- Extra. FFA under 5 per cent
- Special Extra No 1 FFA 7 to 9 per cent.
- Extra No. 1. FFA 12 to 15 per cent
- No. 1. FFA 18 to 20 per cent
- No. 2. FFA 25 to 30 per cent

In addition to its use as a lubricant, this oil, which is permanently liquid, finds extensive use for oiling wool, and in the production of metal-cutting compounds.

NEATSFOOT OIL

Grades:

- Extra Prime. FFA 1 per cent.
- Prime. FFA 5 per cent.
- W. P. Extra Prime, 20 to 25 Cold Test.
- W. P. Extra Prime 30 to 35 Cold Test.
- W. P. Extra Prime 40 to 45 Cold Test.
- Extra No. 1. FFA 12 to 15 per cent
- No. 1, FFA 18 to 20 per cent.

All of our grades of neatsfoot oil are completely soluble in kerosene, alcohol, ether, and other solvents.

Inquiries from all branches of the leather industry will receive prompt and careful attention

Lubrication engineers will do well to give our oleum bubulum careful consideration when working out their problems.

OLEOSTEARIN

Being produced from clean, pure materials, our stearin is always white, odorless and tasteless, and never varies in composition

Inquiries from soap and candlemakers, etc., solicited

TALLOW OIL

Wilson tallow oil (Acidless, FFA never over 1.5 per cent) is produced exclusively from beef tallow. It is of particular interest to soap, candle and grease manufacturers

PURE FOOD GELATINES

For icings, marshmallows, ice cream and jellied fruits

GLUES

For sizing, veneering, jointing and general woodworking

TECHNICAL AND HATTER'S GELATINE

PHARMACEUTICAL AND SCIENTIFIC PRODUCTS

The following substances are prepared in a high degree of purity from by products of Wilson & Co.'s manufacturing operations by

THE WILSON LABORATORIES
4221 South Western Boulevard
CHICAGO, ILL.

- **Abattoir Chemicals**
- **Blood, Dried**
- **Cephalin**
- **Cholesterin**
- **Digestive Ferments**
  - Amylopsin
  - Pancreatin
  - Pepsin
  - Rennin
- **Fibrin**
- **Glandular Desiccations**
- **Lecithin**
- **Ligatures and Surgical Material**
- **Ox-gall**
- **Peptone**
- **Pharmaceutical Elixirs**

OX-GALL

Our inspissated ox-gall is an excellent fat-splitting enzymic product for use in the tanning industry (bating). Inquiries solicited.

DR. ALFRED PFISTER, President and Treasurer
S. E. TYLER, JR., Secretary and Asst. Treasurer

JACQUES WOLF & CO.

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Main Office and Works
PASSAIC, N. J.
New York Office 112 John Street

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"WOLF" Passaic
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All Sulphonated and Saponified Castor Oils
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The best product for dyeing and finishing

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Gum A. N., Parmentine, Lustrose, Excelsior Size.

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Acetate of Alumina, Waterproofing Materials
Artistain
To remove oil and dirt spots.

Hydrosulphite for Discharge Printing and Stripping

Indigolite for Indigo Discharge

Alizarine Yellows
For calico printing and wool dyeing.

Chrome Black
For wool.

Bleaching Oil
A specialty for the kier-boil.

Bensapol
The best wool scouring agent.

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An excellent softener for Sulphur and Developed Blacks.

Textile Gums for Printing
Free from grit; ready for printing.

Gums
Arabic, Karaya, Tragacanth—Dry and in solution.

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- Hoof Meal
- Horns: Cattle
- Oil: Lard, Neatsfoot, and Tallow
- Oleostearin
- Sinews: Green, Salted
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- Fibrin
- Glandular Desiccations
- Lecithin
- Ligatures and Surgical Material
- Ox-gall
- Peptone
- Pharmaceutical Elixirs

OX-GALL

Our inspissated ox-gall is an excellent fat-splitting enzymic product for use in the tanning industry (bating). Inquiries solicited.

Technical and Scientific

BOOKS SECTION

There is a great convenience as well as a saving in ordering a list of several books from one house rather than from individual publishers.

In the following pages will be found a list, practically complete, of books in English dealing with those subjects in which the users of The Chemical Engineering Catalog are likely to be interested. Any of these books may be ordered of us and **will be furnished at the publisher's own net prices.** We will endeavor to secure any available book now in print on these terms.

Market conditions affecting foreign books have not stabilized, and for this reason we have not included many foreign books in this list. We will make every effort to secure foreign works when wanted and welcome correspondence with reference to them.

> Our special book service, as indicated above, includes the selection and purchase of volumes for those desiring to establish libraries, whether individuals or manufacturing concerns. Such libraries may comprise a few books covering some one phase of a subject, or may contain several hundred items. The editorial staff of The Chemical Engineering Catalog includes men trained both in chemical lines and in library work, and the advice and counsel of these men is available for those interested in the installation of libraries in any of the branches included in the broad classification of chemical and allied industries. We shall also be glad to compile bibliographies on any subject in our field. Terms by agreement.

HOW TO FIND THE BOOK YOU WANT

The main entries of books are all made under the last names of the authors, arranged alphabetically, and supplemented by a Subject Index.

If books on a certain specific subject are desired and the authors' names are not known, look in the Subject Index under the name of that subject. For example, you will find in the Subject Index, under Fats and Oils, books by Andes, Archbutt, Bolton, Brannt, etc. By referring to these names in the main author alphabet, the books desired will be found. Note also, that to supply reference to all the literature on such a subject as Lubricants, for instance, the Subject Index shows not only books devoted entirely to that subject, but also other works treating of linseed oil listed under the heading of Fats and Oils, and under Friction.

BOOK TITLES AND DESCRIPTIONS

Spelling of authors' names, titles of books, descriptions, tables of contents, etc., are all taken direct from the publishers' own catalogs. Every precaution has been used to insure accurate transcription and the inclusion of all appropriate items, but we shall be glad to be advised of any errors or omissions that may come to light.

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To firms and individuals not known to us our terms are net cash with order. To those who may desire to open a running account with us, the usual credit courtesies will be extended upon receipt of satisfactory references.

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Payments from countries other than the United States must be made to NET the amount of the bill at the current rate of exchange. Checks should be drawn on U. S. banks or on banks having U. S. connections; otherwise an addition should be made to check to cover bank collection charges.

CONDENSED CHEMICAL DICTIONARY

(SECOND PRINTING CORRECTED)

Published by

The CHEMICAL CATALOG COMPANY, Inc.

One Madison Avenue, New York

DESCRIPTION:

The CONDENSED CHEMICAL DICTIONARY, compiled by the editorial staff of The Chemical Catalog Co., Inc., is a handy reference work of five hundred and twenty five pages giving in condensed and readily accessible form essential information regarding chemicals, minerals and materials in general use.

It contains the names of approximately seven thousand chemicals and substances with cross references, together with their chemical formulas, colors and properties; specific gravities; melting-points; boiling-points; solubility in water, alcohol, ether and other solvents, their derivation and preparation, with a brief outline of the process used, their grades, uses and the kinds of containers in which they are customarily shipped; also the fire hazards, if any, and the railroad shipping regulations pertaining to each item.

The asterisk (*) following the name of the substance indicates which items are at present being produced in America. Paper of good quality is used and there is a wide margin at the bottom of each page for notes and memoranda.

TO WHOM THIS BOOK WILL BE USEFUL:

A copy of The CONDENSED CHEMICAL DICTIONARY will be found indispensable to every chemist; to manufacturers of and dealers in chemicals and chemical equipment, drugs and all commodities which in any way enter into manufacture where chemical processes are used; export and import houses, libraries, transportation companies, fire insurance companies, financial houses, and many others requiring the information contained by this book, for constant use or occasional reference.

STYLES OF BINDING AND PRICES:

Two popular styles of binding are offered: Stiff cover edition for the library, substantially bound in cloth, price $5.00; Flexible edition, on thin paper bound in excellent quality leather cloth with thumb index, price $6.00.

These prices include delivery within the United States and Canada. For other countries 40c for postage and packing per copy should be added.

SPECIMEN PAGE (ACTUAL SIZE)

Dichloroethyl 192 **Diethylanilin**

Dichloroethyl Oxide. See Dichloroether

Dichlorohydrin, Alpha-* (Alpha-propenyldichlorohydrin, Glycerin dichlorohydrin, Dichloroisopropyl alcohol) $CH_2ClCH(OH)CH_2Cl$
Color and properties Colorless, ethereal liquid
Constants Specific gravity 1.396, boiling-point 174°C
Soluble in alcohol and ether, slightly soluble in water
Derivation By the interaction of glycerin and dry hydrochloric acid gas and subsequent distillation
Method of purification Rectification
Grades Technical
Containers Iron drums
Uses Solvent for hard resins and nitrocellulose, manufacture of photographic lacquers, cement for celluloid, binder for water colors, organic synthesis
Fire hazard Dangerous
Railroad shipping regulations. None

Dichloroisopropyl Alcohol. See Dichlorohydrin, Alpha-

Dichloromethane. See Methylene chloride

Dichloromethyl Ether* $(CH_2Cl)_2O$ A military poison gas used in the late war

Dichlorophthalic Acid. See Acid dichlorophthalic

Dicyanodiamide* $NH:C(NH_2)NHCN$
Color and properties Grayish-white powder
Constants Melting-point 204-205°C
Soluble in water and alcohol, sparingly soluble in ether
Derivation By heating cyanamide to 150°C
Method of purification. Crystallization
Grades Technical
Containers Wooden barrels
Uses Fertilizers
Fire hazard None
Railroad shipping regulations: None

Didymium. See Praseodymium an Neodymium

Didymium Nitrate.*
Color and properties Violet-red, hygroscopic crystals Recent chemical investigations show that didymium nitrate consists of a mixture of praseodymium and neodymium nitrates
Derivation: From monazite sand extraction, after removal of cerium and thorium
Grades Technical
Containers Wooden kegs
Uses: Incandescent gas mantles
Fire hazard Dangerous
Railroad shipping regulations Yellow label

Diethylacetal. See Acetal

Diethylaldehyde. See Acetal

Diethylamine* $(C_2H_5)_2NH$
Color and properties Volatile, colorless, inflammable, strongly alkaline liquid
Constants Specific gravity 0.710, boiling-point 56°C
Soluble in water and alcohol
Derivation. By the interaction of dilute potassium hydroxide and dinitrodiethylaniline or nitrosodiethylaniline
Method of purification Rectification
Grades: Technical
Containers: Iron drums
Uses: Organic synthesis
Fire hazard Dangerous
Railroad shipping regulations: Red label

Diethylaniline* $(C_2H_5)_2NC_6H_5$
Color and properties Yellowish to brownish inflammable liquid
Constants Specific gravity 0.9351, melting-point -38° to -39°C, boiling-point 213.5°C
Soluble in alcohol and ether; slightly soluble in water
Derivation (a) By heating aniline, aniline hydrochloride and ethyl alcohol (b) By heating ethyl bromide, aniline and caustic soda in an autoclave
Method of purification: Rectification.

** Indicates made in America*

American Chemical Society
MONOGRAPHS

To develop a desirable chemical literature in English, it has been apparent for some time that there must be some consideration other than the primarily commercial given to the problem, and that the best way to obtain this consideration was by concerted action on the part of individuals or collections of individuals through their professional organizations most interested in having such a literature.

The whole subject was discussed and pretty thoroughly threshed out at the Interallied Conference of Pure and Applied Chemistry, which met in London and Brussels in July, 1919. As a result of this discussion the American Chemical Society agreed to investigate and see what could be done. Prominent publishers of technical books in the United States were consulted, and the problem of a suitable chemical literature along the lines required by the Society, submitted to them.

It can now be said that the American Chemical Society Monographs are at last an assured fact. Four of them have already been produced and others are on the way. Authors for still others are being sought by the Society's Board of Editors, and we are now in a position to say that the hopes of the Society and of those sincerely interested in the development of a chemical literature in English are about to be realized. All that is necessary to assure this success is for the chemists and technical men themselves to recognize individually the work that has been done and to encourage its continuance by the kind of support it deserves.

The American Chemical Society monographs are obtained by the Society and published by The Chemical Catalog Company, Inc., on a thoroughly sound business basis, but under conditions that practically amount to making the undertaking merely self-supporting.

Should there be any profits, the individual authors, the Society and the publishers will participate in them on what has been determined, by the Committee having the matter in charge, as an equitable basis.

You as an individual member of the Society or as a chemist or technical man can aid in this undertaking. You are kindly asked to subscribe *now* for all of the monographs in the series, each book to be shipped and billed you as issued. If you do not care to do this, your order for any particular book or books in the series that may interest you is earnestly solicited.

The Board of Editors selects the authors and subjects for all monographs. The Chemical Catalog Company, Inc., merely acts as publishers. All questions relating to editorial matters should be taken up with the Board of Editors, while matters concerning manufacture and sale should come direct to The Chemical Catalog Company, Inc., 1 Madison Avenue, New York, U. S. A.

BOARD OF EDITORS

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Extract from the "General Introduction," by the Board of Editors.
(Published in Each Book of the Series)

"The development of knowledge in all branches of science, and especially in chemistry, has been so rapid during the last fifty years and the fields covered by this development have been so varied that it is difficult for any individual to keep in touch with the progress in branches of science outside his own specialty. In spite of the facilities for the examination of the literature given by Chemical Abstracts and such compendia as Beilstein's Handbuch der Organischen Chemie, Richter's Lexikon, Ostwald's Lehrbuch der Allgemeinen Chemie, Abegg's and Gmelin-Kraut's Handbuch der Anorganischen Chemie, and the English and French Dictionaries of Chemistry, it often takes a great deal of time to co-ordinate the knowledge available upon a single topic. Consequently when men who have spent years in the study of important subjects are willing to co-ordinate their knowledge and present it in concise, readable form, they perform a service of the highest value to their fellow chemists. * * *

"Two rather distinct purposes are to be served by these monographs. The first purpose, whose fulfilment will probably render to chemists in general the most important service, is to present the knowledge available upon the chosen topic in a readable form, intelligible to those whose activities may be in a wholly different line. Many chemists fail to realize how closely their investigations may be connected with other work which on the surface appears far afield from their own. These monographs will enable such men to form closer contact with the work of chemists in other lines of research.

"The second purpose is to promote research in the branch of science covered by the monograph, by furnishing a well digested survey of the progress already made in that field and by pointing out directions in which investigation needs to be extended To facilitate the attainment of this purpose, it is intended to include extended references to the literature, which will enable anyone interested to follow up the subject in more detail. If the literature is so voluminous that a complete bibliography is impracticable, a critical selection will be made of those papers which are most important.

"The publication of these books marks a distinct departure in the policy of the American Chemical Society, inasmuch as it is a serious attempt to found an American chemical literature without primary regard to commercial considerations. The success of the venture will depend in large part upon the measure of co-operation which can be secured in the preparation of books dealing adequately with topics of general interest; it is earnestly hoped, therefore, that every member of the various organizations in the chemical and allied industries will recognize the importance of the enterprise and take sufficient interest to justify it."

STYLE, SIZE AND BINDING

The monographs will be uniform in size, typographical style, material and binding, though, of course, there will be a great difference in the number of pages, ranging from 130 to 600 The page is six by nine inches in size, the covers are stiff cardboard, bound in dark blue cloth, stamped in gold Some of the books will be profusely illustrated, others will contain no illustrations The paper has been especially selected for uniformity in color and quality

NUMBER OF BOOKS IN THE SERIES

There is practically no limit to the number of books that will be included in the series The Board of Editors will continue securing monographs so long as those already announced continue to demonstrate the success of the undertaking Blanket orders for the entire series are being received and the sale of individual books as announced has been satisfactory. It is hoped, however, that a venture of this kind which promises so much for the good of the science and technology of chemistry, will receive the hearty co-operation and support of the entire profession Advance orders are solicited, and the volume of orders received will indicate to the editors and to the publishers, as well as to the Society and the profession at large, whether or not there is to be any real chemical literature in English along the lines so carefully planned by those having the matter in charge

PRICES

The price of each monograph will depend on the cost of production and the amount of royalty that has to be paid to the author to secure his work It is the earnest desire of the Society, however, to keep the price as low as possible and the publishers are doing their best to meet this desire Unquestionably, there will be a loss to the publishers on some of the monographs, but it is hoped that any such loss will be made up by profits on others

The price of any monograph cannot be announced until date of publication, as there is a great difference in the cost of setting individual monographs and this cost cannot be accurately determined in advance In order to keep close to the cost of production, it is advisable to wait until all costs can be totalled before fixing a price for any monograph In general, however, prices will range between two and six dollars per copy

BLANKET ORDERS FOR THE ENTIRE SERIES

While these monographs will cover a wide range of subjects, many of which will be of little interest to those who are specializing in other phases of chemistry, the value of the series as a whole cannot be over-estimated In view of the fact that the number of each monograph will necessarily be limited, it is suggested that the safest way to obtain the entire series is to place a blanket order covering each monograph as it is issued The books will be billed, under such an order, as they come from the press and are shipped Of course, such an order may be cancelled or broken at any time by notifying the publishers that additional monographs are not desired

Blanket orders are a great aid to the publishers in determining the number of copies of each monograph that shall be printed and are an assurance to the Society as well as to the publishers, that this desire for a chemical literature in English is broadly entertained and is not the wish of only a comparative few

ADVANCE ORDERS FOR INDIVIDUAL MONOGRAPHS

Those not desirous of subscribing for the entire series in advance are kindly requested to send advance orders for the particular monographs they are especially interested in at the earliest opportunity The list shown opposite is, of course, only a partial list of the complete series, but supplementary lists will be issued from time to time, and as these appear they will furnish opportunities for additional selections so that there is no necessity for waiting before ordering

The publishers will, of course, be glad to supply any additional information they may have regarding any monograph under contract or in preparation, and where possible, a rough estimate will be given concerning the price

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The CHEMICAL CATALOG COMPANY, *Inc.*

ONE MADISON AVENUE, NEW YORK, U. S. A.

YOU CAN BUY FROM US ANY TECHNICAL BOOK IN PRINT

Titles and Authors of Monographs

As the exact number of monographs in this series has not been determined, we can list here only those that have thus far (July 1, 1921) been secured by the Board of Editors. The Board is negotiating with possible authors of other monographs and the number to be obtained will be determined largely by the reception accorded those already published and in preparation as listed below:

NOW READY

The Chemistry of Enzyme Actions

By K. GEORGE FALK. 140 pages. Published Jan. 15, 1921. Price $2.50

Chemical Effects of Alpha Particles and Electrons

By SAMUEL C. LIND. 180 pages. Published May 1, 1921. Price $3.00

Organic Compounds of Mercury

By FRANK C. WHITMORE. 395 pages. Published July 15, 1921. Price $4.50

Industrial Hydrogen

By HUGH S. TAYLOR. About 220 pages, illustrated. Published September, 1921. Price $3.50.

IN PREPARATION

Piezo-Chemistry

By L. H. ADAMS. Estimated number of pages, 350, illustrated. (Ready about Dec. 15, 1921.)

The Animal as a Converter

By HENRY PRENTISS ARMSBY. About 250 to 300 pages, illustrated. (Ready about Oct. 20, 1921.)

Cyanamide

By JOSEPH M. BRAHAM. Number of pages not estimated. Date of delivery undetermined.

The Corrosion of Alloys

By COLIN G. FINK. (Ready about Oct. 15, 1921.)

Ammonia Compounds

By E. C. FRANKLIN. Number of pages not estimated. Date of delivery undetermined.

Wood Distillation

By L. F. HAWLEY. Number of pages not estimated. Date of delivery undetermined

Thyroxin

By E. C. KENDALL. (Ready about Feb. 1, 1922.)

The Properties of Electrically Conducting Systems

By CHARLES A. KRAUS. About 400 pages, illustrated. (Ready about Nov. 15, 1921.)

Shale Oil

By RALPH H. McKEE. Ready about Feb. 1, 1922

Carotinoids and Related Pigments: The Chromolipins

By LEROY S. PALMER. About 200 pages, illustrated. (Ready about Sept. 25, 1921.)

Coal Carbonization

By HORACE C. PORTER. About 475 pages, illustrated. (Ready about Nov. 20, 1921.)

Aluminothermic Reduction of Metals

By B. D. SAKLATWALLA. Number of pages not estimated. Date of delivery undetermined.

The Vitamins

By H. C. SHERMAN. About 500 pages, illustrated. (Ready about Dec. 1, 1921.)

The Properties of Silica and the Silicates

By ROBERT B. SOSMAN. About 500 pages, illustrated. (Ready about Dec. 1, 1921.)

The Analysis of Rubber

By JOHN B. TUTTLE. About 225 pages. (Ready about Dec. 1, 1921.)

Zirconium and its Compounds

By F. C. VENABLE. About 300 pages. (Ready about Dec. 15, 1921.)

The Chemistry of Leather Manufacture

By JOHN A. WILSON. About 400 to 500 pages. Ready about March, 1922

The conditions under which these monographs are published are rather unusual and call for initial payment by the publishers to the authors months in advance of the receipt of manuscript. Upon delivery of manuscript an additional advance payment is made by the publishers to the author. In view of this unusual outlay, so far in advance of publication, and in order to enable the publishers to determine so far as possible in advance the number of copies of each monograph to be printed, it is urged that advance orders for all or as many of the monographs as are desired be placed *now*.

No payment is required until the monographs are published and delivered. The publication dates stated above under each title are only approximate, as the Board of Editors has to read each manuscript, criticize, suggest changes, etc., before it reaches the publisher, and this occasionally causes unforeseen delays.

Please order NOW.

BLEACHING TECHNOLOGY

Of Chemical and Related Processes as Applied to Textile Fibers and Other Materials

By J. Merritt Matthews, Ph.D.

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TECHNICAL AND SCIENTIFIC BOOKS·SECTION

ABDERHALDEN, E. Text-Book of Physiological Chemistry In Thirty Lectures By Emil Abderhalden O Professor fur Physiologie des Physiologischen Instituts der Tierarztlichen Hochschule, Berlin, und Universitats Professor Translated by William T Hall, Associate Professor of Analytical Chemistry Massachusetts Institute of Technology, and George Defren 722 p 8 vo. 1908 • $5 00

Contents Introduction, Carbohydrates Fats Albumens or proteins The nucleoproteids and their cleavage products Mutual relations between fats, carbohydrates and albumens, Inorganic foods Oxygen Animal oxidations, Ferments, The functions of the digestive organs The blood, Blood and lymph, The elimination of metabolic products in the body, The relation of the organs to one another, General metabolism, General metabolism, Outlook

ABEGG, R. Electrolytic Dissociation Theory. By Prof R Abegg, Ph D, of the University of Breslau Authorized translation from the German by Carl L von Ende, Ph D, Professor of Chemistry, University of Idaho 180 p 12 mo 1907 **$1 75**

Contents: Preface Fundamental conceptions of the theory Mobility of the ions Equilibria among ions The dissociation constant Equilibria among several electrolytes, Hydrolysis, Avidity, Indicators, Heterogeneous equilibria, Anomaly of strong electrolytes Influence of pressure and temperature on dissociation Non aqueous solutions Chemical nature and ionization tendency of the elements Index.

ABRAHAM, HERBERT. Asphalts and Allied Substances Their occurrence, mode of production, uses in the arts and methods of testing Second edition corrected 635 p 8 vo 208 il. 1920. **$6.00**

Contents: Chemistry of bituminous substances, Geology and origin of bituminous and pyrobitumens, Annual production of asphalts, asphaltites and asphaltic pyrobitumens Semi solid and solid native bituminous substances Methods of refining, Mineral waxes (ozokerite, montan wax, hatchettite, etc), Deposits of natural asphalts occurring in a fairly pure state, Deposits of natural asphalts associated with mineral matter, Asphaltite deposits (gilsonite, glance pitch and grahamite), Asphaltic pyrobitumen deposits (elaterite, wurtzilite albertite and Impsonite), Pyrobituminous shales Tars and pitches. Methods of producing tars and pitches, Wood tar, wood tar pitch and rosin pitch, Peat and lignite tars and pitches, Shale tar and shale tar pitch; Coal tar and coal tar pitch, Oil gas and water gas tars and pitches; Paraffine wax and wax tailings, Petroleum asphalts, Wurtzilite pitch, Fatty acid pitches and bone tar pitch *Manufactured products and their uses* Methods of blending, Bituminous dust preventatives, Bituminous road surfacings, Bituminous fillers for stone or concrete pavement, Sheet asphalt pavements, Asphalt block pavements, Impregnated wood block pavements, Wood preservatives, Asphalt mastic flooring, Bituminous sheet roofings and floor coverings, Asphalt shingles, Bituminous waterproofing membranes, Asphalt insulating and sheating papers, Asphalt plastic compounds Bituminous waterproofing, Compounds for cement, Asphalt paints varnishes and Japans *Methods of Testing* Physical characteristics (color, fracture, lustre, streak, specific gravity, viscosity, hardness, ductility and tensile strength tests), Heat tests (fusing point volatile matter, flash point, burning point, fixed carbon and distillation tests), Solubility tests (in carbon bisulphide carbon tetrachloride petroleum naphtha and other solvents); Chemical tests (water, carbon hydrogen, sulphur, nitrogen, free carbon, naphthalene, paraffine, saturated hydrocarbons, sulphonation residue, mineral matter saponifiable constituents, unsaponifiable matter and glycerol), Analysis of paving materials, Analysis of asphalt plastic compositions, etc , Analysis of sheet roofings, shingles, membranes, etc , Analysis of asphalt paints, varnishes and Japans

ABRAHAM, K. Steam Economy in the Sugar Factory. By Karl Abraham, C E Translated from the German edition by E. J. Bayle, General Engineer, American Beet Sugar Company 96 p. 12 mo. 1912. **$1.50**

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XXXIV Hair dyes and depilatories XXXV Wax pomades bandolines and brilliantines XXXVI Skin cosmetics and face lotions XXXVII Preparations for the nails XXXVIII Water softeners and bath salts XXXIX -Preparations for the care of the mouth XL Colors used in perfumery XLI – Utensils used in the toilet

ASKLING, C. W., and ROESLER, E. Internal Combustion Engines and Gas-producers This work is partly a translation and partly an adaptation of the authors' book on the same subject published in Swedish The work has been divided between the two authors E Roesler has written the first part of the book on Producers, etc and C W Askling has carried out the second part, which deals with Engines, etc The British system of weights and measures has been used throughout, but data have often been given in the metric system 303 p 8 vo il 1912 **$4 50**

CONTENTS Part I The method of working of internal combustion engines compared with that of other heat engines The production, preparation composition and qualities of the fuels mostly employed in gas or oil engines Producers with accessories general principles of design General rules for the care of suction gas plants Producer plants built for gas power purposes

Part II Principal power cycles of internal combustion engines Gas engines Oil engines The Humphrey gas pump Combustion and combustion engines Index

ATACK, F W., and WHINYATES, L., Editors Chemists' Year Book, 1921, including a new section on **Coal-tar.** Sixth edition 1125 p 2 vols 12 mo Not sold separately. **$6.50**

CONTENTS Volume I Atomic Weights 1920, Multiples of the Atomic Weights Formula Weights of Certain Radicals and their Multiples Periodic System of Mendeleeff Qualitative Analysis Reagents Gas Analysis Ultimate Analysis of Organic Substances Electro Chemical Analysis Spectrum Analysis General Properties of Inorganic Substances General Properties of Organic Compounds Notation of Organic Compounds Useful Memoranda Conversion Tables for Weights and Measures Signs used for Medical Prescriptions Five Figure Logarithms Mathematical Constants Mensuration Formulas Powers of Numbers Natural Sines and Tangents Hydrometric Tables, Conversion of Scales of Temperature Conversion of Barometric Readings

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AULD, S. J. M., and EDWARDES-KER, D R. Practical Agricultural Chemistry. 243 p. il 8 vo 1913 **$2.50**

CONTENTS Plant life, Soils, Fertilisers and manures, Feeding stuffs, Dairy products, Examination of waters and soap, Index

AUSTIN, LEONARD S Metallurgy of the Common Metals. 615 p 8 vo il 1921 **$7.00**

CONTENTS Part I General Metallurgy Ores and Metals, Combustion and Fuels, Refractories Sampling, Crushing and Grinding, Screening and Clarifying, Metallurgical Furnaces, Combustion, Metallurgical Thermo Chemistry, Roasting, Concentration of Ores as a Subsidiary Operation in Metallurgy Part II Gold etc

AVRAM, MOIS H. Patenting and Promoting Inventions. 166 p 8 vo 1918 **$1.50**

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BABCOCK & WILCOX CO Steam, its Generation and Use. 335 p 8 vo 35 Ed 1919.

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BACKERT, A O. A.B C. of Iron and Steel. 375 p 4 to il 1919. **$5.00**

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BACON, R. F. and HAMOR, W. A. The American Petroleum Industry. By Raymond Foss Bacon, Ph D, Director and William Allen Hamor, M A, Assistant Director of the Mellon Institute of Industrial Research Volume I, 456 p Volume II, 519 p. 8 vo. il 1916. **$12.00**

It is the first to cover present day American practice is distinctly modern in every respect, and is suitable not only as a general reference work for those engaged in the industry but also as a textbook for students of petroleum engineering It covers the chemistry, geology technology, history and economics of the subject thoroughly It places at the disposal of engineers, chemists and students a complete summary of present day knowledge and practice of this great industry

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BAILEY, E. H. S. Source, Chemistry and Use of Food Products. By E H S Bailey, Ph D, Professor of Chemistry and Director of Chemical Laboratories, University of Kansas, Lawrence 517 p 12 mo il 1914 **$1.60**

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BANCROFT, WILDER D. Applied Colloid Chemistry. General Theory. 345 p. 8vo. il. 1921. **$3.00**

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BARNETT, E. de BARRY. Anthracene and Anthraquinone 436 p 8 vo. 1921. **$6 00**

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BARNETT, E. de BARRY. The Preparation of Organic Compounds. Second edition 273 p 8 vo 1920 **$3 25**

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BASKERVILLE, C. Municipal Chemistry. Contributed by leading authorities Edited by Charles Baskerville, Ph D, F. C S, Professor of Chemistry, College of the City of New York. 526 p. 8 vo. il. **$5.00**

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BATTLE, JOHN ROME. Handbook of Industrial Oil Engineering. A reference book of data, tables, and general information for the use of lubricating engineers, oil salesmen, operating engineers, mill and power plant superintendents and machinery designers, etc 333 p 8 vo il 1916 **$10.00**

Discusses the theory of lubrication, describes the various oils and greases, and tells how they are tested Chapters are devoted to rolling and sliding friction, the lubrication of steam cylinders, the use of oil and grease cups and filters the management of oil houses, and information concerning the relation of the steam indicator to lubrication Part 4 takes up in detail the applications to several special types of machinery, as air compressors, automobiles, coal mining machinery, Diesel engines, baking machinery, electric cars, passenger and freight elevators, flour milling machinery, refrigerating and ice making apparatus, internal combustion engines, marine engines, motors and dynamos, printing machinery, pneumatic tools, locomotives and cars, rolling mills, textile machinery, transformers, turbines, and wire drawing machinery. Part 5 considers costs and specifications Printed in large clear type, and provided with many illustrations, tables, and charts

BAUER, O., and DEISS, E. The Sampling and Chemical Analysis of Iron and Steel. By O Bauer and E. Deiss, of the Royal Testing Bureau at Gross-Lichterfelde, Germany. Translated from the German by William T. Hall and Robert S. Williams, Assistant Professors of Analytical Chemistry, Massachusetts Institute of Technology. 373 p. 12 mo. il. 1915. **$3.00**

Contents: Part I —Sampling of iron and steel. I —The importance of proper sampling for chemical analysis. II.—Arrangement of a metallographic laboratory to be used as an aid in taking samples for analysis III – Treatment of the polished specimens. IV —Metallographic characteristics of the constituents occurring in iron and steel. V The causes of local differences in the chemical composition of iron and steel VI Taking samples in the works VII White iron Ferro manganese Chilled castings and malleable castings VIII —Gray cast iron IX Ingot iron and mild steel X Wrought iron. XI Samplings in special cases Part II Analysis of iron and steel I Carbon II Silicon III Manganese IV Phosphorus V.—Arsenic VI Sulphur VII Copper VIII Nickel IX Cobalt, X Chromium XI Aluminum XII Titanium XIII Iron XIV. Tungsten XV Vanadium XVI Molybdenum XVII Oxygen XVIII Nitrogen Atomic weights

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BAYLISS, W. M. Enzyme Action (Monographs on biochemistry) Third edition, revised and enlarged 180 p 8 vo il 1914 **$2.60**

The author is a professor in the University of London

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BEAN, PERCY, and McCLEARY, W. The Chemistry and Practice of Finishing. A practical treatise on bleaching and the finishing of white, dyed, and printed cotton goods Second edition Two volumes. 824 p 8 vo 1912 **net $15.00**

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BEATTY, J The Method of Enzyme Action By James Beatty, M A, M D, D P H, Northampton, England With an introduction by E H Starling, F R S 143 p 8 vo 1917.

Contents Preface, Introduction, Catalysis Summary, General Considerations on Enzymes, Colloids, Adsorption, The Properties of Enzymes, Chemical Action, Oxidation and the Oxidases, Reduction and the Reducases The Method of Enzyme Action, A Hypothesis, Deductions, Conclusion, Index

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BEECH, F. Dyeing of Cotton Fabrics. A practical handbook for the dyer and student. Containing numerous recipes for the production of cotton fabrics of all kinds, of a great range of colors, thus making it of great service in the dyehouse, while to the student it is of value in that the scientific principles which underlie the operations of dyeing are clearly laid down. Second edition. 27 p. 8 vo. il. **$5.00**

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BENSON, H. K. Industrial Chemistry for Engineering Students. Third edition. 431 p. il. 12 mo. 1913. **$2.75**

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BERNEWITZ, M. W. Von, Editor. **Cyanide Practice.** 1910 to 1913. 732 p. 8 vo. il. 1913. **$3.00**

CONTENTS Historical, Chemistry of Cyanidation, Special Problems, Crushing, Concentration and Treatment of Concentrates, Roasting, Agitation, Decantation, Filtration, Precipitation and Clean-up, Disposal of Residue, Measurement, and Estimation of Tonnages, Recent Cyanide Practice by Districts, Description of Notable Mills, Review of Progress by Years.

BERNTHSEN, A. A. Textbook of Organic Chemistry. Edited and revised to date by J. J. Sudborough. 735 p. 12 mo. il. 1912. **$3.50**

CONTENTS Aliphatic or open-chain compounds. Hydrocarbons. Haloid substitution products of the hydrocarbons. Monohydric alcohols or alkyl hydroxides. Derivations of the alcohols. Aldehydes and ketones. Monobasic fatty acids. Acid derivatives. Polyhydric alcohols. Hydroxy monobasic acids and compounds related to them. Dibasic acids. Polybasic acids. Cyanogen compounds. Carbonic acid derivatives. Carbohydrates. Chemistry of the cyclic compounds. Carbocyclic compounds. Polymethylene derivatives. Benzene derivatives. Benzene hydrocarbons. Halogen derivatives. Nitro-substitution products of the aromatic hydrocarbons. Amino-derivatives or arylamines. Diazo and azo-compounds. Hydrazines. Aromatic sulphonic acids. Phenols. Aromatic alcohols, aldehydes, and ketones. Aromatic acids. Compounds containing two or more benzene nuclei. Diphenyl group. Diphenylmethane group. Dibenzyl group. Triphenyl-Methane group. Compounds with condensed benzene nuclei. Anthracene and phenanthrene groups. Heterocyclic compounds. Furane group. Compounds formed by the condensation of a Benzene nucleus with a furane, thiophene, or pyrrole ring. Pyrazole group. Six-membered heterocyclic rings. Quinoline and acridine groups. Six-membered heterocyclic compounds with four carbon atoms in ring. Alkaloids. Terpenes and Camphors. Resins. Glucosides. Albumins. Physiological chemistry. Reduction. Oxidation. Stereochemistry of sulphur, selenium, tin, and nitrogen compounds. Relationships between physical properties and chemical constitution. Fermentation and enzyme action. Catalytic action of finely divided metals and metallic oxides. Unsaturation. Aliphatic diazo and triazo compounds.

BERRY, A. J. Volumetric Analysis. 137 p. 8 vo. il. 1915. **$1.65**

The author is a Fellow of Downing College, Cambridge, England.

BERSCH, J. The Manufacture of Earth Colors. Translated from the Third German Edition (as revised by Prof. Dr. Wilhelm Bersch) by Charles Salter. 216 p. 8 vo. 31 il. **$3.00**

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BEST, W. N. Science of Burning Liquid Fuel, a practical book for practical men. 159 p. 8 vo. il. 1913. **$2.00**

CONTENTS Introduction, Liquid fuel, its origin, production and analysis, Atomization, Oil systems, Refractory material, Locomotive equipment, Stationary and marine boilers, Ovens, Furnaces, Index.

BETTS, A. G. Lead Refining by Electrolysis. By Anson Gardner Betts. 3[illegible] p. 8 vo. il. **$4.00**

A book based upon [illegible] years of study, experiment and practical work.

CONTENTS [illegible] Electrolytes, Slime treatment, Deposition of antimony, Electrolytic refining, Manufacture of hydrofluoric and fluosilicic acids, [illegible] Refinery construction, operation and costs, Production, Analytical and experimental work, Bibliography, Appendices, [illegible] plates.

BEVERIDGE, JAMES. Papermaker's Pocketbook. Specially compiled for paper mill operatives, engineers, chemists and other officials. Second and enlarged edition. 211 p. 16 mo. il. **$4.00**

CONTENTS Chapter I covers the commercial side of the paper making, being taken up with tables of weights and measures, wages, sizes and weights of papers, metrical equivalents, British and American trade customs, and other useful information that is likely to be required in the papermakers' daily work. Chapter II deals with thermal questions, containing data amplified with concrete examples for the calculation of the consumption of steam in the various heating operations of the paper mill, such as boiling, bleaching and drying. The third chapter is devoted to raw materials, giving much information on straw, esparto, wood pulps and rags. There is a chapter on colored papers and dyestuffs, followed by one on chemical analysis and testing, and the chapter on mineral loadings is new. The seventh chapter consists of a good selection of useful chemical tables, and chapter VIII comprises information as to dimensions, capacity, speeds and power consumption of the principal machinery found in mills.

BEYSCHLAG, F., VOGT, J. H. L., and KRUSCH, P. The Deposits of Useful Minerals and Rocks. Their Origin, Form and Content. 3 vols. 8 vo. il. Vol. 1, 514 p. 1914-1916. **$5.00**
Vol. 2, **$5.25**. Vol. 3, in preparation.

Vol. I. CONTENTS Introduction, Classification, Form and Graphic Reproduction of Ore Deposits, The Manner and Cause of Fracture, Mineral Content of Ore Deposits, Mineral Formation, Relative Distribution of the Elements, Natural Association of the Elements with Special Reference to the Metals, The Origin of Ore Deposits, The Absolute and Relative Amounts of the Metals and Useful Ore Deposits, Primary and Secondary Depth and Zones, Indications of Ore Deposits at the Surface, The Scientific Classification of Ore Deposits, Magmatic Segregations, Contact Deposits, Annex Lodes, Irregular Activity Fillings and Metasomatic Deposits, Quicksilver Group.

Vol. II. CONTENTS Young Gold Silver Lodes, Individual Occurrences, Old Gold Lodes, Metasomatic Gold Deposits, Gold Silver Production of the World; The Lead-Silver-Zinc Lodes, The Radio-Active Uranium Lodes, General, The Metasomatic Lead-Silver-Zinc Deposits, The World's Production of Lead-Zinc Ores, The Antimony Lodes, The Metasomatic Antimony Deposits, The Metasomatic Iron Deposits, General, The Manganese Lodes, General, The Metasomatic Manganese Deposits, General, The Copper Lodes, General, The Metasomatic Copper Deposits, The Pyrite-Arsenopyrite Lodes, The Metasomatic Pyrite Deposits, The Native Copper Deposits, The Copper Production of the World, Nickel-Cobalt Arsenide Lodes, Nickel Silicate Deposits, The Nickel Production of the World, The Cobalt Production of the World, Genesis of Lodes; Resume, Iron Ore Beds, Chemistry of Sedimentation, Iron Ore Production of the World, The Manganese Ore Beds, General, The Manganese Ore Production of the World, Copper Shale Beds, General, Fahlbands, General, Pyrite Beds, General, The Auriferous Conglomerates, General, Lead, Zinc and Copper Beds, General, Antimony Ore Beds, General, The Tin, Gold and Platinum Gravels, General, Geographical Index, Subject Index.

BICHEL, C. E. New Methods of Testing Explosives. Translated and edited by Axel Larsen, M. Inst. M.E. 62 p. 8 vo. **$2.75**

CONTENTS Introductory. Historical. Testing-stations. Power gauges. Products of combustion. Heat of decomposition. Rate of detonation. Length and duration of flame. After-flame ratio. Transmission of explosion. Conclusions. Efficiency.

BIDDULPH-SMITH, THOMAS. Coke-Oven and By-Product Works Chemistry. 176 p. 8 vo. il. 7 folding plates. 1920. **$7.00**

CONTENTS Washery and Oven Gas, Analysis of the Gas, Flue Gases, Tar Distillation Plant, Testing of the Fractions on Tar Distillation, Estimation of Free Carbon in Tar and Pitch, Ammonium Sulphate Plant, Analysis of Crude Benzol, Commercial Benzols, The Analysis of Commercial Benzols, The estimation of Xylene in Solvent Naphtha, Estimation of Thiophen, Estimation of Carbon Bisulphide, Index.

BIGELOW, S. L. Theoretical and Physical Chemistry. Fourth edition. 544 p. 8 vo. 1920. **$3.50**

SECTION I. The Principles of Science, The Name, Scope and Value of Our Subject, The Scientific Method, Fundamental Definitions. SECTION II. Stoichiometry, Unit Quantities of Chemistry and Chemical Notation, The Atomic and Molecular Theories, Chemical Energy, Affinity and Valence, The Periodic System, Spectroscopic Evidences and the Theory of Inorganic Evolution, Luminiferous Ether and Vortex Rings; Radioactivity and the Electron Theory. SECTION III. Properties; Gases, Vapor Densities, Liquids, Index of Refraction, Solids, Solutions, Osmotic Phenomena and the Theory of Dissociation in Solution, Rotation of the Plane of Polarized Light, Solid Solutions, Colloidal Solutions, Liquefaction of Gases, Vapor Pressure, Some Elementary Thermodynamic Deductions, Vapor Pressure of Solutions; The Process of Solution and Precipitation, Velocities of Chemical Reactions, Equilibria in Chemical Reactions, Thermochemical Data, Electrochemistry: The Quantity Factor, Electrochemistry: The Intensity Factor; Actinochemistry, Appendix; Index.

BILTZ, HENRY. Practical Methods for Determining Molecular Weights. 245 p. 8 vo. il. **$2.00**

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BJORLING, PHILIP R., and GISSING, FREDERICK, T Peat, Its Uses and Manufacture. 173 p 12 mo $2 50

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BLAIR, ANDREW ALEXANDER The Chemical Analysis of Iron. Eighth edition, largely rewritten 348 p 8 vo il 1918 $5.00

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BLOXAM A. G., and LEWIS, S J. Chemistry, Inorganic and Organic With Experiments. Tenth edition rewritten and revised by Arthur G Bloxam F I C, and S Judd Lewis, D Sc, F I C Tenth edition [illegible] p 8 vo il 1913 $7.00

This work is intended for those studying chemistry as a branch of general education as well as for those professionally interested in the science The work has gradually acquired an encyclopedic character and the editors have greatly increased its value by including precise details from original memoirs Lucid explanations of common phenomena and experiments illustrating them have been retained for the general reader

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BOCKMANN, F Celluloid, Its Raw Material, Manufacture, Properties and Uses A handbook for manufacturers of celluloid and celluloid articles and all industries using celluloid, also for dentists and teeth specialist Translated from the Third Revised German Edition [illegible] p 8 vo il $2 50

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BOURCART, E. Insecticides, Fungicides, and Weed Killers. Translated by D Grant 431 p 8 vo il 1916 **$6.00**

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BOWSER, E. A. An Elementary Treatise on the Differential and Integral Calculus. With numerous examples Twenty-third edition Enlarged by 640 additional examples. 465 p. 12 mo il **$2.25**

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General information regarding uses, production, prices, distribution and theories of ore distribution is followed by reports of the mines of the several counties Part 2, of over 140 pages, is devoted to a general and excellent up-to-date treatise on metallurgy, assaying and concentration Part 3 has a full bibliography Contains many maps and illustrations

BRAHAM, JOSEPH M. Cyanamide. American Chemical Society Monograph. In preparation.

BRAME, J. S. S. Fuel· Solid, Liquid, and Gaseous. By J S S Brame, F C S, Instructor in Chemistry, Royal Naval College, Greenwich, Lecturer on Fuel, Sir John Cass Technical Institute, Aldgate. 385 p. 8 vo il. 1919 **$5.40**

Contents Part I Solid fuels; Introduction; Wood, peat, and minor solid fuels, Coal and its constituents, Commercial varieties of coal, Treatment and storage of coal, Briquettes and powdered coal, Cokes and coking, Special forms of coke Part II Liquid fuel, Composition and character of fuel oils, System of burning oil fuel, Liquid fuel for internal combustion engines, Heavy fuel oils for internal combustion engines Part III Gaseous fuel; Coal gas and coke oven gas, Water gas, Gaseous fuels of low calorific value, Simple producer gas (Siemens gas) and "mixed" producer gas (Dowson gas), Producer gas plants and blast furnace gas, Fuel consumption and general considerations in power production Part IV Fuel analysis calorimetry and control of fuel supply, Fuel analysis, Determination of calorific values, Purchase of fuel and control of combustion, Appendix, Index.

BRANNT, WM. T., and GRAY, J. B. Practical Dry Cleaner, Scourer, and Garment Dyer. Fifth edition, revised, enlarged and entirely reset. 306 p il. 8 vo. 1920. **$3.00**

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BRANNT, WILLIAM T. Practical Treatise on the Manufacture of Vinegar. With special consideration of wood vinegar and other by-products obtained in the destructive distillation of wood; the preparation of acetates; manufacture of cider and fruit-wines, preservation of fruits and vegetables by canning and evaporation; preparation of fruit-butters, jellies, marmalades, pickles, mustards, etc.; preservation of meat, fish and eggs Third edition, thoroughly revised and largely re-written. Cloth 543 p. 8 vo il. 1914. **$6.00**

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BRANNT, WM. T., and MEERBOTT, P. B. Soap Maker's Hand Book. Third edition. Completely revised. 8 vo. 624 p. il 1921. **$7.50**

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BREARLEY, HARRY. Heat Treatment of Tool Steel, an illustrated description of the physical changes and properties induced in tool steel by heating and cooling operations 223 p. 8 vo il 1916. **$4.50**

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BROMLEY, HENRY ALDOUS. Outlines of Stationery Testing. A Practical Manual 74 p. 12 mo il. 1913. **$1.25**

Contents Introductory Paper Its physical examination Paper: Its microscopical examination Paper Its chemical examination The characteristics and requirements of special papers Parchments, vellums,

BROMLEY, HENRY ALDOUS. Paper and Its Constituents: A Manual of Technical Methods Containing Chemistry and Analysis of Raw Materials, Paper-Making Fibers, Bleaching, Sizing and Carding Agents and Dyestuffs; Microscopy, and Physical and Chemical Properties of Papers. 240 p. il. 8 vo. 1920. **$6.00**

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BROOKS, BENJAMIN T. The Chemistry of the Non-benzenoid Hydrocarbons and Their Simple Derivatives. To be published by The Chemical Catalog Co., Inc. Ready about Nov. 1, 1921. 450 to 500 p. **$6.00**

Contents: The paraffins; Occurrence in nature; Formation; Chemical properties; The paraffin hydrocarbons, The ethylene bond; The preparation of olefines; The unsaturated hydrocarbons, Polymerization of unsaturated hydrocarbons; General methods of synthesis of cyclic non-benzoid hydrocarbons; The sesquiterpenes; Rearrangements; Physical properties; Physiological and related properties.

BROWN, HAROLD. Rubber, Its Sources, Cultivation and Preparation. 237 p 8 vo il 1910 **$2.50**

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BROWN, NELSON C. Forest Products Their Manufacture and Use. 471 p. 8 vo 120 figures **$4 00**

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CONTENTS General Wood pulp and paper, Tanning materials, Veneers, Slack cooperage, Tight cooperage, Naval stores Hardwood distillation, Softwood distillation, Charcoal, Boxes and box shooks, Crossties, Poles and piling, Posts, Mine timbers, Fuelwood, Shingles and shakes, Maple syrup and sugar, Rubber, Dye woods and materials, Excelsior, Cork

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BROWN, WM. A. The Portland Cement Industry. A practical treatise on the building, equipping and economical running of a Portland cement plant With notes on physical testing 168 p. 8 vo. il. 1917. **$3 00**

CONTENTS. Introductory, Historical, Development of the industry, Manufacture, Raw materials, Design and construction of a modern Portland cement plant The rotary kiln, Power plants Miscellaneous, Costs and statistics, Equipment, Development of cement testing, Chemical composition; Fineness, Tensile strength, Time of setting, Soundness or constancy of volume

BROWNE, C. A. A Handbook of Sugar Analysis. A practical and descriptive treatise for use in research, technical and control laboratories 888 p 8 vo il 1912 **$6 00**

This book includes the occurrence, methods of preparation, properties and reactions of the different sugars and their allied derivatives

CONTENTS Part I—Physical and Chemical Methods of Sugar Analysis, Sampling, Moisture determinations Refractometer, Polarimeters, Saccharimetry, Miscellaneous methods Part II Descriptive Classification of the Sugars and Their Formations in Nature

BROWNING, P. E. Introduction to the Rarer Elements. By Philip E Browning, Ph D, Assistant Professor of Chemistry, Kent Chemical Laboratory, Yale University Fourth edition, thoroughly revised 250 p 8 vo 1917 **$2.50**

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BRUCE, EDWIN M. Detection of the Common Food Adulterants. Third edition, revised and enlarged 95 p 16 mo. 1917. **$1.40**

CONTENTS. Dairy products, Meat and eggs, Cereal products, Leavening material, Canned and bottled vegetables, Fruits and fruit products, Flavoring extracts, Saccharine products, Spices, Vinegar, Fats and oils; Beverages

For this edition the book has been greatly enlarged and added to, so that it now contains the latest and most approved tests for the adulterants It aims to give the qualitative tests for the purity of various foods, and includes a list of the more common adulterants

BRUNNER, R. Manufacture of Lubricants, Shoe Polishes and Leather Dressings. Such as axle and machinery greases, oils, machinery oils, clockmakers' oils, as well as shoe polishes Translated from the sixth German edition by Charles Salter 170 p. 12 mo. il. **$3.50**

BRUNSWIG, H. Explosives. By Dr. H. Brunswig Translated and Annotated by Charles E Munroe, Ph D, and Alton L Kibler, M S, George Washington University. 350 p 8 vo. il. 1912 **$3.50**

The material is presented for convenient reference and future use. A synoptic and critical treatment of the literature of the subject as gathered from various sources

CONTENTS: General behavior of explosive systems Conditions governing explosive reactions Rate of increase of pressure The maximum explosive pressure Temperature of explosions The gases from explosive reactions Characteristics of particular explosives. Changes in explosives, igniters, fuses and detonators. Mercury fulminate Propellants Hints on handling, application and destruction of explosives.

BRUSH, GEORGE F. Manual of Determinative Mineralogy. With an introduction on blowpipe analysis Revised and enlarged by S L Penfield 312 p 8 vo il 1907 **$3.50**

The sixteenth edition of this standard work Professor Penfield has compiled completely new tables for the determination of minerals

CONTENTS Introduction Apparatus and reagents Reactions of the elements Tabular arrangement of reactions Physical properties of minerals Tables for the determination of mineral species Indexes

BUCHANAN, J. F. Brass Founders Alloys. A practical handbook for the guidance of manufacturers and tradesmen 129 p. 12 mo il 1911. **$1.50**

CONTENTS Introduction Uses and characteristics of the common metals Some peculiarities of alloys Common methods of making alloys Brass founders' alloy The modern alloys Miscellaneous, alloys and tables Index

BUEHLER, F. A Filters and Filter Presses for the Separation of Solids and Liquids. 184 p 8 vo il 1914 **$5.00**

With additional matter relating to the theory of filtration and filtration in sugar factories and refineries, by John Joseph Eastick, F I C, A R S M The authors discuss the methods of the various types of filters and suitable methods of arranging them to minimize labor and space They also consider the theory of filtration and describe the preparation of the solutions for filtration, the substances used as aids to filtration and the precautions to be taken

BULLENS, DENISON K. Steel and Its Heat Treatment. Second edition, thoroughly revised 484 p 8 vo il 1918 **$4.00**

Second edition has about fifty additional pages of illustrations and information of a practical nature especially concerning forging and annealing and the "human element"

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BULLOCK, WM. Timber: From the Forest to Its Use in Commerce. (Pitman's Common Commodities and Industries) 149 p. il. 12 mo 1920 **$1.00**

CONTENTS Introduction, Notes on the history of timber as connected with Great Britain, The coniferous trees of commerce, European and other Eastern species in use at the present time The coniferous timbers of Canada and other countries in the Western hemisphere, The hardwood or broad-leaf section of trees The mahoganies of commerce, Some account of the different varieties of mahogany, The mahogany products of the West Coast of Africa The European varieties of hardwoods commonly in use, Hardwood timbers from Asiatic sources, The hardwood timbers of Japan and the Australasian colonies, Some account of the hardwood timbers of Canada and the United States that are supplied to British markets, The hardwood timbers of Central and South America, Some notes on the extraction of timber in various countries; The outlook for future supplies

BURGESS, C. F., and CRAVENS, G. W. Applied Electrochemistry and Welding. 132 p 8 vo. il 1917 **$1.50**

A practical treatise on commercial chemistry, the electric furnace, the manufacture of ozone and nitrogen by high tension discharges, and the applications of electric, gas, and chemical welding to manufacturing and repair work

BURGESS, G. K., and LE CHATELIER, H. The Measurement of High Temperatures. By G K Burgess, Bureau of Standards and H Le Chatelier, Membre de L'Institut Third edition, rewritten and enlarged 510 p. 8 vo il 1912. **$5.00**

This book will aid the engineer who desires to adapt some method or instrument to his particular technical investigation, the investigator who requires accurate methods of measurement, and the student to whom fundamental principles are of prime interest

CONTENTS Standard scale of temperatures Pyrometers Calorimetric pyrometry The laws of radiation Various pyrometric methods. Standardization of pyrometers Bibliography

BURGESS, PAUL S. Soil Bacteriology Laboratory Manual. 123 p. il. 12 mo 1914 **$1.25**

CONTENTS: Individual apparatus, General apparatus, Laboratory rules, Practice, Humification of organic matter, Practice, Cellulose fermentation, Practice, Isolation in pure culture of bacteria causing cellulose fermentation, Practice, The bacterial "count" of soils, Practice; Ammonification in solutions ("Remy's Method"), Practice Ammonification in soils ("Beaker Method"), Practice, The ammonification of dried blood by pure cultures in soils, Practice, The ammonification of urea, Practice, Nitrification in solutions ("Remy's Method"), Practice, Isolation of the nitrite producing organisms by the "Gypsum Block Method", Practice, Nitrification in soils ("Beaker Method"), Practice; The influence of moisture content on nitrification in soils, Practice; The influence of soluble organic matter on nitrification in soils, Practice, Denitrification in solution, Practice, Sulphate reduction by soil bacteria; Practice, Aerobic non-symbiotic nitrogen fixation by soils in solution, Practice, The Isolation of pure cultures of Azotobacter, Practice, Non-symbiotic nitrogen fixation in soils ("Beaker Method"), Practice; Nitrogen fixation by pure cultures of azotobacter in soils, Practice, The effect of varying reaction of the soil on non-symbiotic nitrogen fixation, Practice, Anaerobic fixation of nitrogen, Practice, The isolation, growth and study of Bacillus radicicola from the nodules of different legumes; Practice, The iron bacteria, Practice, Growth and study of soil protozoa, The controlled growth of legumes inoculated and uninoculated Appendix A Cleaning and sterilizing glassware, The sterilization of soil, The sterilization of seeds Appendix B Preparation of culture media Appendix C Preparation of stains and methods of staining; Simple stains, Simple staining, Gram staining, Moller's method of spore staining, Hiss' method of capsule staining Appendix D Chemical methods, Humus determination Determination of ammonia, Determination of nitrates, Total nitrogen, Qualitative test for nitrates; Qualitative test for nitrites, Qualitative test for ammonia Appendix E. Koch's plate culture method Appendix F The growth of plants under controlled conditions Appendix G Stock cultures. Appendix H.

Table of autoclave pressures and temperatures; Comparative table of weights and measures. Appendix F. Comparison of Centigrade and Fahrenheit thermometer scales.

BUTLER, EDWARD. Modern Pumping and Hydraulic Machinery. As Applied to all purposes, With Explanation of the Theoretical Principles Involved, Construction, Working, and Relative Advantage. 473 p. 8 vo. il. 1913. **$5.50**

The author presents in a clear and concise form information especially useful to practical engineers, designers, and others engaged either in the construction or application of pumping and hydraulic machinery.

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BUTLER, EDWARD. Oil Fuel. Its Supply, Composition, and Application. Third edition, greatly enlarged. 328 p. 12 mo. il. 1914. **$3.75**

CONTENTS Origin, production, and sources of supply The economic aspect and heat value of liquid fuel Chemical composition of fuel oils. Conditions of combustion in oil fuel furnaces Early combustion methods for oil fuel. Steam, air, and pressure jet burners, etc, used in land and marine boilers The relative advantages of steam, compressed air, and mechanical action as an atomising agent for liquid-fuel burners Oil fuel for marine purposes Oil fuel for naval purposes. Oil fuel on locomotives Oil fuel for road vehicles and motor launches Oil fuel for metallurgical and other purposes. Oil fuel for lighting and domestic purposes. Index

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BUTLER, G. MONTAGUE. Pocket Handbook of Blowpipe Analysis. Designed for the use of students and prospectors with the idea of making oral instruction unnecessary. First edition, corrected. 12 mo. Cloth. 85 p. 1916 **$1.00**

CONTENTS: Blowpipe instrument, Reagents and operations, Methods of testing for the various elements with the blowpipe, Outline for qualitative blowpipe analysis; Index to all of the tests yielded by the various elements; The determination of minerals by means of the blowpipe; The elementary principles of chemistry, Table of elements with their symbols and atomic weights, Index

BUTLER, GORDON MONTAGUE. Handbook of Mineralogy, Blowpipe Analysis and Geometrical Crystallography. 16 mo. il. 1918. **$3.50**

CADY, HAMILTON P. General Chemistry. (International Chemical Series.) 522 p 12 mo il 1916. **$3.25**

An abridgement and simplification intended for classes which have less time to devote to the subject than those for whom the "Inorganic Chemistry" was intended

CADY, HAMILTON P. Inorganic Chemistry. (International Chemical Series.) 606 p 8 vo. il. 1912 **$3.50**

This textbook is a distinctive attempt to make an advance in methods of instruction It is the result of a logical rearrangement of the subject matter which has been tried out by the author for several years in his classroom work.

CAHEN, EDWARD, A.R.C.S., and WOOTTON, WILLIAM ORD, A.R.C.S., B.S.C. (Lond.). The Mineralogy of the Rarer Metals with foreword by F. W. Harbord, A.R.S.M., F.I.C. Second edition. 211 p. 16 mo. Limp leather. 1919. **$4.00**

The authors of this handbook have adopted Dana's classification and have compressed into the smallest possible space all the latest available facts, thus placing in the hands of the prospector, in an accessible form, information which cannot fail to be of considerable value at home and in the field.

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CAIN, J. C. Chemistry and Technology of the Diazo Compounds. Second edition. 199 p. 8 vo. 1920. **$4.20**

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CAIN, JOHN CANNELL. Manufacture of Intermediate Products for Dyes. Second edition. 273 p. 8 vo. 1919. **$4.50**

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CAIN, JOHN CANNELL, and THORPE, JOCELYN FIELD. The Synthetic Dyestuffs and the Intermediate Products from which they are derived. 423 p. 8 vo. il. 1913. **$6.50**

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Part III—Analytical Intermediate products. The application of the coloring matters. The valuation of a coloring matter The quantitative and qualitative analysis of dyestuffs. Investigation of dyestuffs on the fiber. Appendix. Index

CAIN, W. Brief Course in the Calculus. With figures and diagrams. Second edition, revised. 290 p. 8 vo. il. 1911. **$1.75**

CALVERT, A. F. Salt. (Pitman's Common Commodities and Industries.) 151 p. il. 1919. **$1.00**

CONTENTS The chemistry and properties of salt, The beginnings of the salt industry; The Cheshire wiches; Development of brine processes, Formation and extent of the Cheshire deposits, The Cheshire subsidence; Latest methods of salt making, The salt market

CALVERT, G. T. The Manufacture of Sulphate of Ammonia and Crude Ammonia. Second edition, revised and enlarged. 165 p. 8 vo il 1911 **$4.00**

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CAMPBELL, ANDREW. Petroleum Refining. With a foreword by Sir Boverton Redwood, Bart 313 p. 8 vo. il. 1918. **$8.50**

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CAMPBELL, N. R. The Elements of Physics. 565 p. 4 to. 1920. **$12.50**

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CAMPBELL, H. H. Manufacture and Properties of Iron and Steel. By Harry Huse Campbell, Metallurgical Engineer for the Pennsylvania Steel Co., Maryland Steel Co, and the Spanish-American Steel Co. Fourth edition. 639 p. 8 vo. il. 1896. **$6.00**

This book has been a standard for metallurgists, steel manufacturers and students for a number of years

CONTENTS. The main principles of iron and steel metallurgy. Pig iron. Wrought iron steel Crucible steel. Acid Bessemer process Basic Bessemer process. Open hearth process (acid and basic). Segregation. Specifications on structural material. Welding Steel castings Inspection Errors in chemical records.. The metallurgy of iron and steel Primitive methods of making iron The blast furnace. Wrought iron. Steel. High carbon steel. The acid Bessemer process. The Basic Bessemer process. The open hearth furnace. Fuel. The acid open hearth process. The Basic open hearth process Special methods of manufacture and some items affecting the costs. Segregation and homogeneity. Influence of hot working on steel. Heat treatment The history and shape of the test-piece. The influence of certain elements on the physical properties of steel. Classification of structural steel. Welding. Steel castings The iron industry of the leading nations. Factors in industrial competition. The United States, Great Britain, Germany, France, Russia, Austria, Belgium, Sweden, Spain, Italy, Canada. Statistics. Appendix.

CAMPBELL, LORN. Oxyacetylene Welding Manual. 154 p. 8 vo. 92 figures. **$1.50**

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CAPES, WILLIAM PARR, and CARPENTER, JEANNE DANIELS. Municipal Housecleaning. The methods and experiences of American cities in collecting and disposing of their municipal wastes. 232 p. 8 vo. 1918 **$6.00**

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CARNEGIE, D., and GLADWYN, S. C. Liquid Steel Its Manufacture and Cost. By David Carnegie, assisted by Sidney C. Gladwyn. Second edition. 546 p 8 vo il. 1918 **$10.00**

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CARR, W. M. Open-hearth Steel Castings. 118 p 16 mo il. 1907. **$1.50**

A complete exposition of the methods involved in the manufacture of open hearth steel castings by the basic and acid processes. The work is compiled from a series of articles by the author, written for and published by the *Iron Trade Review* and the *Foundry*

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CHALKLEY, A. P. Diesel Engines for Land and Marine Work. With an introduction by Dr. Rudolf Diesel. Fourth edition, revised and greatly enlarged. 380 p. 8 vo. il 1916. **$5.00**

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CHALMERS, T. W. The Production and Treatment of Vegetable Oils. By T W. Chalmers, B Sc, A. M I. Mech. E On the Editorial Staff of "The Engineer." 155 p. 4 to. 1918. **$7.50**

Contents Introductory and general; The principal vegetable oils; Preparatory machinery for copra and linseed; Preparatory machinery for palm fruit and palm kernels, Preparatory machinery for cotton seed and castor seed, Some special forms of reduction machinery, Meal kettles, receiving pans and moulding machines, Oil presses Anglo American type, Oil presses cage type; The general arrangement of oil mills; Extraction of oil by chemical solvents; The refining of oils; The hydrogenation or hardening of oils; The generation of hydrogen for oil hardening purposes, The manufacture of soap, Glycerine recovery and refining and the splitting of oils

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CHARNOCK, G. F. Mechanical Technology. 645 p. 8 vo. il. 1915. **$3.50**

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Extrusion of metals; The manipulation of sheet metals by flanging, dishing, drawing, embossing, etc.; The drawing press and examples of work; Coining press.

CHAUVENET, REGIS. Chemical Arithmetic and Calculation of Furnace Charges. 302 p. 8 vo. 1912. **$4.00**

This volume forms a manual for reference as well as a text for the student. Although bound into one volume it is really two treatises; many principles given in the first part find application on the second. Numerous examples are given, and the exposition throughout is so simplified that it is readable by any person fairly versed in elementary chemistry.

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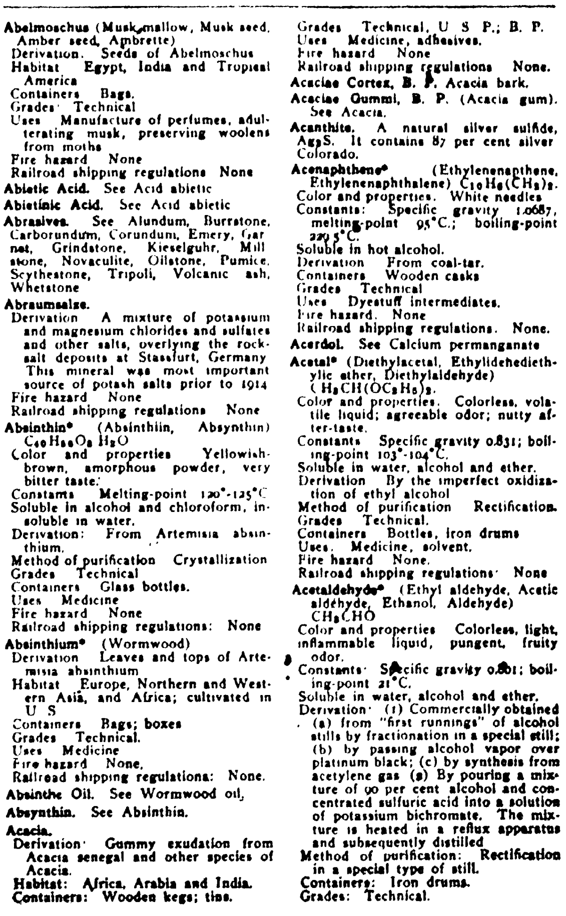

Abelmoschus 9 **Acetaldehyde**

Abelmoschus (Musk-mallow, Musk seed, Amber seed, Ambrette)
Derivation. Seeds of Abelmoschus
Habitat Egypt, India and Tropical America
Containers Bags.
Grades Technical
Uses Manufacture of perfumes, adulterating musk, preserving woolens from moths
Fire hazard None
Railroad shipping regulations None

Abietic Acid. See Acid abietic

Abietinic Acid. See Acid abietic

Abrasives. See Alundum, Burrstone, Carborundum, Corundum, Emery, Garnet, Grindstone, Kieselguhr, Millstone, Novaculite, Oilstone, Pumice, Scythestone, Tripoli, Volcanic ash, Whetstone

Abraumsalze.
Derivation A mixture of potassium and magnesium chlorides and sulfates and other salts, overlying the rock-salt deposits at Stassfurt, Germany This mineral was most important source of potash salts prior to 1914
Fire hazard None
Railroad shipping regulations None

Absinthin* (Absinthiin, Absynthin) $C_{40}H_{56}O_8\ H_2O$
Color and properties Yellowish-brown, amorphous powder, very bitter taste.
Constants Melting-point 120°-125°C
Soluble in alcohol and chloroform, insoluble in water.
Derivation: From Artemisia absinthium.
Method of purification Crystallization
Grades Technical
Containers Glass bottles.
Uses Medicine
Fire hazard None
Railroad shipping regulations: None

Absinthium* (Wormwood)
Derivation Leaves and tops of Artemisia absinthium
Habitat Europe, Northern and Western Asia, and Africa; cultivated in U S
Containers Bags; boxes
Grades Technical.
Uses Medicine
Fire hazard None.
Railroad shipping regulations: None.

Absinthe Oil. See Wormwood oil,

Absynthin. See Absinthin.

Acacia.
Derivation: Gummy exudation from Acacia senegal and other species of Acacia.
Habitat: Africa, Arabia and India.
Containers: Wooden kegs; tins.
Grades Technical, U S P.; B. P.
Uses Medicine, adhesives.
Fire hazard None
Railroad shipping regulations None.

Acaciae Cortex, B. P. Acacia bark.

Acaciae Gummi, B. P. (Acacia gum). See Acacia.

Acanthite. A natural silver sulfide, Ag_2S. It contains 87 per cent silver Colorado.

Acenaphthene* (Ethylenenapthene, Ethylenenaphthalene) $C_{10}H_6(CH_2)_2$.
Color and properties. White needles
Constants: Specific gravity 1.0687, melting-point 95°C.; boiling-point 220.5°C.
Soluble in hot alcohol.
Derivation From coal-tar.
Containers Wooden casks
Grades Technical
Uses Dyestuff intermediates.
Fire hazard. None
Railroad shipping regulations. None.

Acerdol. See Calcium permanganate

Acetal* (Diethylacetal, Ethylidenediethylic ether, Diethylaldehyde) $CH_3CH(OC_2H_5)_2$.
Color and properties. Colorless, volatile liquid; agreeable odor; nutty after-taste.
Constants Specific gravity 0.831; boiling-point 103°-104°C.
Soluble in water, alcohol and ether.
Derivation By the imperfect oxidization of ethyl alcohol
Method of purification Rectification.
Grades Technical.
Containers Bottles, iron drums
Uses. Medicine, solvent.
Fire hazard None.
Railroad shipping regulations: None

Acetaldehyde* (Ethyl aldehyde, Acetic aldehyde, Ethanol, Aldehyde) CH_3CHO
Color and properties Colorless, light, inflammable liquid, pungent, fruity odor.
Constants: Specific gravity 0.801; boiling-point 21°C.
Soluble in water, alcohol and ether.
Derivation: (1) Commercially obtained (a) from "first runnings" of alcohol stills by fractionation in a special still; (b) by passing alcohol vapor over platinum black; (c) by synthesis from acetylene gas (2) By pouring a mixture of 90 per cent alcohol and concentrated sulfuric acid into a solution of potassium bichromate. The mixture is heated in a reflux apparatus and subsequently distilled
Method of purification: Rectification in a special type of still.
Containers: Iron drums.
Grades: Technical.

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COSTE, J. H., and ANDREWS, E. R. The Examination and Thermal Value of Fuel. Gaseous, liquid and solid. 278 p. 8 vo. il. 1914. **$2.50**

CONTENTS: Introductory Part I—Chemical and general physical examination of fuel. Sampling Analysis Sources of liquid fuel The examination of liquid fuels Sampling of solid fuel or coal Analytical examination of coal, classification of coals on results of analysis. Part II—Calorimetry Preliminary Historical sketch of thermometry Objects of calorimetry. Calorimetric measurement. The calorimeter proper Thermometers. Influence of surroundings The capacity for heat of the calorimetric system Measurement of gas Still water calorimeters Flow calorimeters. Calculation from heats of combustion and analysis The calorimetry of liquid fuel Calorimeter of solid fuel. Oxidising mixture calorimeters Low pressure oxygen calorimeters. High pressure oxygen (bomb) calorimeters Index

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Intended to provide for employers, superintendents, foremen, underwriters, safety inspectors and engineers generally, a convenient summary of standard safety methods and devices as developed and perfected by those who have specialized in this subject Tried and proved methods and devices are described and illustrated reflecting the experience, methods and ideas of practical men manuacturers, operators, contractors and engineers in varied fields of industrial activity This book is the result of careful observations made in hundreds of mills and manufacturing establishments, in building and construction work, railroad operation, handling explosives and mining

COWELL, W. B. Pure Air, Ozone and Water. A practical treatise of their utilization and value in oil, grease, soap, paint, glue and other industries. 91 p. 12 mo. il. **$2.50**

CONTENTS Atmospheric Air, Compressed Air, Liquid Air, Purification of Water, Fleshings and Bones, Ozonized Air in the Bleaching and Deodorizing of Fats, Glues, etc , General Information

CRANE, WALTER R. Gold and Silver. 727 p. 8 vo. il. 1908. **$5.00**

Comprises an economic history of mining in the United States, the geographical and geological occurrence of precious metals, with their mineralogical associations, history and description of methods of mining and extraction of values, and a detailed discussion of the production of gold and silver in the world and in the United States

CRESSY, E. Discoveries and Invention of the Twentieth Century. 398 p. 8 vo. il. 1915. **$2.50**

CONTENTS: Revival of water power. Coal, gas, and petroleum. Steam power Gas, petrol and oil engines Generation and transmission of electricity Electric lighting and heating Speed and economy in factory and workshop Foundry and forge Electric furnace Artificial production of cold Soil and crops Railways electric traction Motor cars Modern ships Conquest of the air Wireless telegraphy Ships of war Applications of photography. Radium, electricity and matter Index

CROCKER, F. B., and ARENDT, M. Electric Motors: Their Action, Control and Application. Second edition, revised and enlarged 315 p. 8 vo il 1914. **$3.00**

Aims to set forth the action and operation of various types of electric motors, with comprehensiveness, for persons who study or use these machines, even including students and practitioners who specialize in electrical engineering The present edition contains many amendments and additions, both in text and illustrations, to make the subject matter clearer and more complete

CONTENTS: Introduction Types of motors and advantages of electric drive Direct current motors. Action of shunt motors Shunt-motor starting boxes. Shunt motor speed control by variation of resistance of armature circuit Multiple-voltage systems of motor speed control Speed control of shunt motors by variation of field current. Speed control of motors by variation of field reluctance Direct current series motors Control of direct current series motors Compound-wound motors. Alternating current motors. Classification and history Synchronous alternating-current motors Polyphase induction motors Starting of polyphase induction motors Speed control of polyphase induction motors Single phase induction motors. Commutating alternating current motors Applications of electric motors Service conditions. Power requirements of various tools, etc

CROFT, T. American Electricians' Handbook. By Terrell Croft Total issue 20,000. 711 p. 16 mo 1913. Flexible leather, full gilt. **$4.00**

A reliable, useful handbook for wiremen, contractors, linemen, plant superintendents and construction engineers It aims to give the practical man the facts on apparatus, materials and installation which he needs in his daily work It does not go into design It gives only enough theory to explain why you should do certain things in certain ways.

CROFT, T. Wiring for Light and Power. By Terrell Croft. 426 p. Flexible binding, pocket size. 1917. **$3.00**

This book explains clearly, in simple language, how to install wiring and apparatus for practically all services, under practically all conditions It fills the demand for a book that will enable experienced as well as inexperienced wiremen to meet the requirement of the National Electrical Code, and, at the same time, by logical arrangement and thorough indexing, show quickly what the Code requires and why wiring should be done in a given way

CROOKES, W. Select Methods in Chemical Analysis, (Chiefly Inorganic). By Sir William Crookes, F.R.S. Fourth edition, rewritten and enlarged. 762 p. 8 vo. il. 1905. **$8.00**

CROSBY, EVERETT; FISKE, H. A., and FORSTER, H. W. Handbook of Fire Protection. Sixth edition, revised and enlarged. 757 p. 12 mo. il. 1919. **$4.00**

CONTENTS: *General* Fundamental principles of fire protection; Fire protection an engineering science; Relation of accident prevention to fire prevention; National fire protection association; National Board of Fire Underwriters; Underwriters' laboratories *Causes of Fire.* Common fire causes; Dangerous substances found in manufacturing plants; Topical list of fire causes. *Spread of fire.* Retarding the spread of fire; Fire resistive construction; Slow burning construction (also known as mill construction); Structural improvements for existing buildings; Roofs and roof coverings; Protection of wall openings (including partitions); Building codes. *Construction for special occupancies.* Department stores, Dwellings; Garages; Hotels; Office buildings; Schools; Theatres. *Extinguishment of fire.* Public fire departments (and high pressure systems); Water supply for private protection; Outside private protection; Interior fire extinguishing apparatus (exclusive of automatic sprinklers); Automatic sprinkler protection; Rules and requirements for automatic sprinkler systems; Alarm valves for automatic sprinkler systems; Dry pipe valves for automatic sprinkler systems; Sypho chemical sprinkler system and service, Open sprinklers; Signaling systems and watchman service *Miscellaneous* Egress facilities and drills; Self-inspection; Protection of records and valuables; Conflagration hazard and protection, Standard plan notations; Publications on fire protection. *Tables.* The tables and how to use them.

CROSS, CHARLES FREDERICK, and BEVAN, E. J. A Textbook of Paper-making. By C. F. Cross and E. J. Bevan. Fourth edition, with collaboration of J. F. Briggs. 507 p 8 vo. 1916. Reprinting

Fourth edition of this standard work, represents considerable revision and embodies the results of the authors' working experience It is stated that their collaborator, Mr Briggs, has had the advantage of continuous practical work in one of the leading British paper mills and that "the matter which he has contributed presents a series of illustrations of sound mill practice based upon scientific first principles Besides describing manufacturing processes there are chapters on testing, analysis, selection of a mill site, paper specialties, and statistics. There is a good annotated bibliography at the end of the volume. The illustrations are noteworthy, especially the photomicrographs

CROSS, C. F., BEVAN, E. J., and SINDALL, R. W. Wood Pulp and Its Uses. With the Collaboration of W. N. Bacon 281 p. 12 mo. il. **$3.50**

CONTENTS: The structural elements of wood Cellulose as a chemical individual and typical colloid Sources of supply of wood-pulps Manufacture of mechanical wood pulp Chemical wood pulp News and printings. Wood pulp boards Utilization of wood waste. Testing of wood pulp for moisture Wood pulps and the textile industries. Specimen pages and various types of paper Bibliography.

CROSS, ROY. Handbook of Petroleum, Asphalt and Natural Gas. 500 p 8 vo. il. Flexible 1920 **$5.00**

CONTENTS: Methods of analysis, transportation, storage, tank gauging, Pipe lines, Chemical and physical properties of various products and hydrocarbons; Production and refining statistics including list of refiners and producers, Conversion tables, Commercial distillation, refining, cracking and engineering; Oil shales; Patents and bibliography, Geology and economics.

CROWELL, B., and MURRAY, C. B. Iron Ores of Lake Superior. Containing some facts of interest relating to mining and shipping of the ore and location of the principal mines. 264 p 8 vo. il. 1914. **$3.50**

A description in detail of the principal mines and mining districts

CONTENTS: Early history Geology Mineralogy Production Dock equipment. Classification of ores Benefication of ores Methods of analysis Fuel engineering. Location and description of mines. Index.

CUSHMAN, ALLERTON S. Chemistry and Civilization. 150 p. 8 vo. il. 1920. **$2.50**

CONTENTS: Chemistry in the past, Chemistry in the service of man; Chemistry and industry; Chemistry and war, Chemistry and the future, Some modern aspects of chemistry.

DAKIN, H. D., and DUNHAME, E. K. Handbook on Antiseptics. 129 p. 16 mo. il. 1917. **$1.25**

DANA, G. Automatic Sprinkler Protection. By Gorham Dana, Manager of Underwriters Bureau of New England Second edition. 443 p 8 vo il. 1919 **$3.50**

CONTENTS Introduction Perforated pipes Early automatic systems and sprinklers Later developments in automatic sprinklers Tests and characteristics of sprinklers Installation rules Layout of equipments. Alarm valves. Dry valves Sprinkler supervisory systems Maintenance and fire record Sprinkler leakage Automatic sprinklers as a protection to life. Combined heat and sprinkler systems. Sypho chemical sprinkler system Appendix I—List of over 250 sprinklers described and rated. Result of tests on 6,277 old types of sprinklers Appendix II—Standard report blank for inspection by the assured

DANA, J. D. System of Mineralogy of James Dwight Dana, 1837-1868. Descriptive mineralogy Sixth edition By Professor Edward S. Dana, Yale University Entirely rewritten and much enlarged. With Appendix Second appendix revised, completing the work to 1909 Third appendix issued separately in 1915. 1323 p. 4 vo. il. 1910 **$15.00**

This book is a complete classification of all the mineral species according to a natural arrangement Although founded on the external characters of the minerals it exhibits in a considerable degree the chemical relations also In the present edition the scope and usefulness of the work has been much enlarged by the inclusion of the knowledge made available by optical and microscopical studies of the various minerals

CONTENTS: Introduction Crystallography mineralogy Nomenclature. Bibliography. General classification I—Native elements II—Sulphides, tellurides, selenides, arsenides, antimonides. III—Sulpho-salts—sulpharsenites, sulphantimonites, sulphobismuthites IV Haloids—chlorides, bromides, iodides, fluorides V—Oxides VI—Oxygen salts—carbonates, silicates, hydrous silicates, niobates, tantalates, phosphates, arsenates, antimonates, borates, sulphates, chromates, tungstates, molybdates. VII—Salts of organic acids—oxalates, mellates. VIII—Hydro-carbon compounds Supplement Catalogue of American localities, Appendices I and II, completing the work to 1909.

DANA, RICHARD T. Handbook of Construction Equipment, Its Cost and Use. Author is Consulting Engineer, also Chief Engineer, Construction Service Company. 849 p. 351 il. 12 mo. 1921. Flexible. **$6.00**

A complete manual on construction equipment. The descriptions include practically every type of equipment, as well as cost data It presents data which the engineer often searches through masses of trade catalogs and card index files to find. The arrangement of the material is alphabetical.

The book is offered in lieu of a new edition of the Handbook of Construction Plant.

The prices have been revised as of 1920. Some of the material in the old book is omitted, and about twice as much material as made up the old book has been added, so that this new book is about three times as large in content as its predecessor

CONTENTS: Main Topic Heads: General principles applying to equipment, Air compressors, Asbestos, Asphalt plants; Automobiles; Backfilling machines; Bar cutters, Barges and scows; Bars; Belting for power purposes; Bending machines; Bins, Blacksmith shop outfit; Blasting machines and supplies, Blocks; Blue print machines; Boilers; Brick rattler; Buckets, Buildings, Cableways, Cars; Carts, Cement gun, Cement testing apparatus, Chains, Chain blocks; Chutes; Concrete placing equipment, Concrete sidewalk and curb forms, Conveyors; Crushers; Derricks driving outfits, Drag scraper, Excavators; Drawing boards, Dredges, Drills, Electric motors, Elevating graders, Engines; Explosives, Fire equipment, Forges; Fork forms; furnaces and kettles; Grading machines, Heaters, Hoisting engines, Hoists; Horses and Mules, Hose, Hydraulic mining giants; Jacks, Lead, Levels, Lights; Locomotives and locomotive cranes, Machine shop outfit, Mixers, Motor trucks, Point spraying equipment, Paulins, Photography; Picks and mattocks, Pier and foundation equipment, Pile drivers, Piling, Pipe, Pipe line tools; Plant rental charges, Plows, Post hole diggers, Power pumps, Rails and tracks, Rakes, Refrigerating plant, Riveting guns; Road making equipment, Rollers, Rope, Sand blast machines, Sand and gravel washers, Saws, Scales, Scarifiers, Screens, Shovels; Skips; Sledges and hammers, Sprinklers, Stone boats, Stump pullers, Surveying and Engineering equipment, Tampers, Tents, Ties, Tow boats; Tractors, Trailers, Transits, Trenching machines, Unloading machines; Wagons, Welding, Wheelbarrows, Winches

DANBY, ARTHUR. Natural Rock Asphalts and Bitumens. Their geology, history, properties and industrial application. 254 p. 8 vo. il. 1913. **$2.50**

CONTENTS: Nomenclature and definitions Geology of bitumen and rock asphalt Appearance and physical structure History and ancient use Modern exploitation of rock asphalt Sources of rock asphalt and bitumen American deposits of bitumen Extraction and preparation of rock asphalt Tests and analyses Physical properties of rock asphalt. The carrying out of rock asphalt work, and of rock asphalt mastic work Macadam roads. Other uses of bitumen.

DANCASTER, ERNEST A. Limes and cements; their nature, manufacture and use, an elementary treatise. 220 p. 12 mo. il. 1920. **$2.75**

An up to date book of over 200 pages based upon Burnell's *Limes, cements, mortars, etc* Has a good bibliography, also chapters on waterproofing, efflorescence, stucco, bituminous and oleaginous cements, chemical analysis, and physical and mechanical testing

DANIELS, F. E. Operation of Sewage Disposal Plants. 136 p 8 vol. 1915. **$1.50**

Reprinted from articles in the *Municipal Journal* The main purpose is to assist the plant attendant by pointing out to him many things he should do and some things he should leave undone

DARLING, C. R. Heat for Engineers. A Treatise on Heat, with special regard to its practical application. By Charles R. Darling, Assoc. R.C.Sc., Demonstrator in the Department of Applied Physics and Electrical Engineering, and Lecturer on Heat at the City and Guilds Technical College, Finsbury, London. 430 p 8 vo il. 1914 **$5.00**

CONTENTS OF CHAPTERS: I Heat as a form of energy Units. II.—Methods of producing heat The properties, uses, and evaluation of fuels. III—Specific heat. IV. Expansion. V Practical applications of the property of expansion VI Atmospheric pressure. General properties of gases VII The measurement of temperature Liquid and gas thermometers VIII The measurement of high temperatures. Pyrometry. IX Change of state Fusion X—Practical applications of fusion and allied phenomena XI Vapors XII—Ebullition XIII—Latent heat of vaporisation Properties of steam XIV—Atmospheric moisture Hygrometry XV—The production of low temperatures. Liquefaction of gases XVI Refrigerating machinery, ice manufacture and cold storage XVII—The transfer of heat Conduction. 18 The transfer of heat Convection XIX.—The transfer of heat Radiation XX The conversion of heat into work Laws of thermodynamics XXI—The conversion of heat into work Practical heat engines Index Index to tables

DARLING, ELTON R. Inorganic Chemical Synonyms and Other Chemical Data. 109 p. 12 mo. 1919. **$1.00**

CONTENTS Introduction, The Elements; Specific Gravity and Temperature Comparison, Standards of Weights and Measures; Chemical Synonyms Aluminum, Antimony, Arsenic, Barium, Bismuth, Cadmium, Calcium; Chromium, Cobalt; Copper; Iron, Lead (Plumbum); Magnesium, Manganese; Mercury (Hydrargyrum), Nickel, Potassium, Silver, Sodium; Zinc; Miscellaneous Synonyms, Hydrogen Compounds, Cross Index of Chemical Terms

DAUGHERTY, R. L. Centrifugal Pumps. By R. L. Daugherty, A.B., M.E., Professor of Hydraulic Engineering, Rensselaer Polytechnic Institute. A complete but simple treatment of the subject in all its phases 192 p. 8 vo. il 1915. **$2.50**

CHAPTER HEADINGS: I—Introduction. II.—Description III.—Installation and operation. IV—General theory. V—Theory of centrifugal pumps VI—Characteristics. VII—Disk friction VIII.—Factors affecting efficiency IX Centrifugal pumps vs displacement pumps X.—Comparison of types of centrifugal pumps XI—General laws and factors XII—Pump testing XIII—Costs XIV—Rotary and screw pumps XV—Applications of centrifugal pumps. XVI—Design of a centrifugal pump Appendix—A. Test data. B—Review questions C Table of ¼ powers of numbers.

DAVEY, HENRY. The Principles, Construction, and Application of Pumping Machinery. (Steam and Water Pressure.) With practical illustrations of engines and pumps applied to mining, town water supply, drainage of lands, etc.; also economy and efficiency trials of pumping machinery. Second edition, revised and enlarged. 336 p. 8 vo. il **$6.00**

CONTENTS: Early history of pumping engines Steam engines (pumping). Pumps and pump valves. General principles of non-rotative pumping engines. The Cornish engine: simple and compound Types of mining engines. Pit work Shaft sinking through water bearing strata. Hydraulic transmission of power in mines Electric transmission of power to pumps Valve gears of pumping engines. Water pressure pumping engines Waterworks engines. Pumping engine economy and trials of pumping machinery. Centrifugal and other low-lift pumps. Hydraulic rams, pumping mains, etc. Index.

DAVIES, JAMES. Galvanized Iron. Its manufacture and uses. A detailed description of this important industry and its manufacturing processes, by James Davies. 139 p 8 vo. 1914. **$1.50**

Contents. Importance of galvanized iron trade; Rates of carriage; Cost of materials, Arrangement of a works, The best markets; Methods of packing, Prices; Brands, Corrugating, Rolling from steel bars; Heathfield process; Bayliss process, Original process, Best process, Weight of coating; Close annealing, Pickling, Prices of labor; Quality of spelter, Galvanizing baths, Treatment of zinc ashes; Flux skimmings, Treatment of dross, Approximate cost of curved roofs, To estimate the weight of roofs, Prices for fixing, Cost of making gutters and ridging, Approximate cost of machinery for galvanized, corrugated, iron ridging, gutters, tanks and cisterns, buckets, etc

DAVIS, PAUL B., and others. Studies on Solution in its relation to light absorption, conductivity, viscosity, and hydrolysis 144 p 8 vo il 1908 **$2.00**

DAVY, W. M. and FARNHAM, C. M. Microscopic Determination of the Ore Minerals. 154 p 8 vo. **$2.50**

Contents Introduction Previous work Color and unreliable determinative factor Lack of consistency in reactions -Advantages of employing few reagents in the tables Necessity for utilizing all determinative means Range of material examined Definition of mineragraphy I Technique of Polishing and Examining the Specimen Necessity for specialized polishing methods -Grinding Polishing- Field preparation of a specimen by hand Examination of the specimen - Microscope used Optical principle involved Construction and use of finder Method of applying tests Electrical conductivity Electropotential of minerals Concentration of reagents II Photomicrography of Polished Sections Equipment Color filters Methods of determining proper exposure Exposure curves- Developing and printing III Use of the Determinative Tables Procedure Abbreviations used Outline for the tables Determinative tables IV Supplementary Tests Tabular arrangement according to Color of surface, Color of internal reflection, Color of powder, Electrical conductivity, Electro Potential—Tests for the elements with minerals arranged according to elements —Microchemical qualitative reactions Standard fusibilities Heating on charcoal Sublimates Bead colors with borax and salt of phosphorus

DAWE, EDWARD A. Paper and Its Uses. A treatise for printers, stationers and others. 162 p 8 vo il. 1914 **$2.25**

DAWIDOWSKY, F. Glue, Gelatin, Animal Charcoal, Phosphorus, Cements, Pastes, and Mucilages. 282 p. 8 vo. 1920. **$3.00**

This volume covers the raw materials and manufacture of skin and bone glue, animal charcoal, phosphorus, and gelatine and the products prepared from it, isinglass and fish glue, methods of testing glue and gelatine, and the preparation and application of cements, pastes and mucilages for use in the workshop, laboratory and office

DEERR, N. Cane Sugar. A textbook on the agriculture of the sugar cane, the manufacture of cane sugar, and the analysis of sugar house products. Together with a chapter on the fermentation of molasses. 608 p. 8 vo. il. Second edition

Contents The cane; Composition of the cane, Range and climate, Varieties of the cane, Sugar cane soils, Manuring; Irrigation, husbandry, pests and diseases, and harvesting of the cane, Extraction of juice by mills, Diffusion process, Clarification and defection of the juice, Carbonation process, Filtration of the juice, Evaporation of the juice to syrup, Concentration of the syrup to massecuite, Separation of the crystals; Molasses, Megass as fuel; Polariscope as applied to sugar analysis, Optical assay of sugars, Determination of reducing sugars, Assay of sugar house products; Control of the factory, Fermentation with special reference to the sugar house; Appendix, Tables, Additional notes relating to certain portions of the text

DE LA COUX, H. The Industrial Uses of Water. Translated from the French and revised by Arthur Morris 362 p 8 vo. il. 1903 **$5.00**

Contents: Water, its chemical action and composition, Effects of water in the industries, Difficulties with water, Appropriate remedies, Preliminary treatment and apparatus, Residuary waters and their purification; Qualitative, quantitative and hydrotimetric analysis

DE LAVAL, C. G. Centrifugal Pumping Machinery. By Carl George De Laval, General Manager, Henry R Worthington. 184 p. 8 vo. il. 1912. **$3.00**

A treatise on theory and practice, with definite details on the design of centrifugal and turbine pumps. Mr De Laval's aim has been to supply accurate and definite information which can be used in design, construction and installation The material on installations, uses and efficiency is taken from his actual experience

DEL MAR, A. Tube Milling. By Algernon Del Mar, Associate of the Royal School of Mines of London, Mem A I M E. 159 p. 8 vo. il. 1917. **$2.00**

This book covers the use of the conical and cylindrical tube mills for grinding ores, indicating in detail the best means of obtaining capacity at the least cost. It is the first book devoted entirely to this subject.

Contents: Introduction I—General description II Amalgamating with the tube mill III—Grinding ores with the tube mill for flotation, IV—Crushing efficiencies V—The use of wrought iron and alloy steel. Appendix

DENNIS, L. M. Gas Analysis. By L. M. Dennis, Head of the Department of Chemistry in Cornell University. 434 p. 8 vo 1913. **$2.75**

The author, who translated Hempel's "Methods of Gas Analysis," has now prepared a book of his own which embodies the results of the most recent research and the newest methods Detailed consideration is given to the collection and storage of gases, the measurement of large gas volumes, the purification of mercury, the determination of individual gases, the fractional combustion of certain gases, the analysis of flue gas, illuminating gas and fuel gas, the determination of the heating value of solid, liquid and gaseous fuels, the complete analysis of commercial acetylene, the determination of water vapor and carbon dioxide in the atmosphere, the analysis of saltpeter with the nitrometer, and the applications of the Lunge nitrometer to gas volumetric work. The book also contains descriptions of several new forms of apparatus or new methods, among which may be mentioned a portable Hempel apparatus, a new form of Orsat apparatus, a modified nitrometer, a method for the determination of phosphine in commercial acetylene, and an improved form of apparatus for the fractional combustion of hydrogen by means of copper oxide

DENNIS, L. M., and WHITTELSEY, T. Qualitative Analysis. Revised edition. By L. M. Dennis, Head of the Department of Chemistry and Professor of Inorganic Chemistry in Cornell University, and Theodore Whittelsey, Director of the General Laboratories, United States Rubber Company, New York City. 145 p. 8 vo 1912 **$1.00**

This manual is both exact and compendious, avoiding the diffuseness of the larger treatises and the incompleteness of the elementary books.

DERR, L. Photography for Students of Physics and Chemistry. By Louis Derr, M A, S B, Professor of Physics in the Massachusetts Institute of Technology. 247 p. 12 mo. 1916. **$2.25**

DESCH, CECIL H. Chemistry and Testing of Cement. 267 p 8 vo. 1911. **$4.00**

Contents History of calcareous cement; Raw materials and process of manufacture, Chemical compounds, Constitution of cement, Setting and hardening, Mechanical properties, Resistance to destructive agents, Chemical analysis, Conclusion, Indexes.

DESCH, CECIL H. Intermetallic Compounds. 116 p. 8 vo. 1914. **$1.60**

Contents Introduction Thermal analysis; Microscopic structure; Isolation of intermetallic compounds; Native intermetallic compounds; Physical properties, Existing in the liquid state, Relations to carbides, silicides, etc, Chemical nature, Ternary compounds, Index.

DICTIONARY, CHEMICAL, CONDENSED, (See Condensed Chemical Dictionary).

DIETERICHS, ERNEST E. F. A Practical Treatise on Friction, Lubrication, Fats and Oils. Second edition, thoroughly revised and enlarged. 153 p 12 mo 1916 **$1.50**

Contents I—Friction II—Lubrication III.—Oils and fats. IV- Oils and fats of mineral and vegetable origins, their preparation, and how they are obtained V- Clarifying, refining and bleaching oils and fats VI Mineral oils VII Petroleum oils VIII -Manufacture of lubricating oils IX - "Valve oleum" oils X—Leather oils XI Adulterations of fatty oils XII—Testing oils XIII—Solid lubricants Greases XIV—Some practical suggestions XV—Lubricators and cups XVI—Specific gravity XVII Review of the petroleum oil industry to 1915 Index

DIETERICH, K. Analysis of Resins, Balsams, and Gum Resins. With a bibliography. Translated from the German Second edition Revised and enlarged by H. B Stocks. 447 p. 8 vo. 1920. **$7.00**

Contents: General Discussion and Exposition, Origin Habitat, General Properties, Commercial Varieties, Adulterants, Analysis and Bibliography of All Balsams, Resins and Gum Resins

DOLT, MAURICE L., Ph.D. Chemical French, An Introduction to the Study of French Chemical Literature. 308 p. Cloth 8 vo. 1920 **$4.00**

This book is intended for students of chemistry wishing to acquire a reading knowledge of French in that particular science For those who have had one or two years of French, the reading of scientific French will still offer certain difficulties which an ordinary dictionary will not solve, and for those who have not had any French, the task will be enough to discourage them The book can be used by a beginner or a class of beginners The selections were made carefully, with two things in mind first, to give practice in reading original articles in the different branches of chemistry, second, to give an opportunity to American student to get acquainted with the pioneering work of the French chemists These selections include articles published in the French journals of chemistry by some of the best known French chemists.

DONKIN, BRYAN. A Textbook on Gas, Oil, and Air Engines. Fifth edition, revised and enlarged, with revision by Prof. Burstall and T. Graves Smith, M I.Mech.E. 639 p. 8 vo. il. 1905. **$9.00**

Contents: Part I—Gas engines.—General description of the action and parts of a gas engine. Heat "cycles" and classification of gas engines History of the gas engine The Atkinson, Griffin, and Stockport engines The Otto gas engine Modern British gas engines. Modern French gas engine German gas engines. Gas production for motive power. Utilization of blast-furnace and coke oven gases for power The theory of the gas engine The chemical composition of gas in an engine cylinder The utilization of heat in a gas engine. Explosion and combustion in a gas engine

Part II.—Petroleum Engines—The discovery, utilization, and properties of oil Methods of treating oil. Carburettors Early oil engines Working methods in oil engines. The Priestman oil engine. Other British oil engines American gas and oil engines French and Swiss oil engines. German oil engines. Practical application of gas and oil engines.

Part III.—Air engines.—Theory of air engines Difficulties. Trials. Appendices Bibliography. Index.

DONKIN, BRYAN. The Heat Efficiency of Steam Boilers: Land, Marine and Locomotive, with tests and experiments on different types, heating value of fuels, analyses of gases, evaporation, and suggestions for testing boilers. 311 p. 8 vo. il. 1905. **$7.00**

Contents: Classification of different types of boilers. Explanation of the headings of the tables Tables of experiments on boilers Fire grates of various types Mechanical stokers. Combustion of fuel in boilers. Transmission of heat through boiler plates and their temperature. Feed water heaters, superheaters, feed pumps, etc. Smoke and its prevention. Instruments used in testing boilers. Marine and locomotive boilers. Fuel testing stations. Discussion of the trials and conclusions. On the choice of a boiler, and testing of land, marine, and locomotive boilers. Appendices. Bibliography. Plates of steam boilers. Index.

DORLAND, W. A. N. (Editor). American Pocket Medical Dictionary. Tenth edition. 67 p. 16 mo. 1917. **$1.50**

DOTY, ALVAH H., M.D. A Manual of Instruction in the Principles of Prompt Aid to the Injured. 229 p. 12 mo. 1914. **$2.00**

DOWD, MARY T., and JAMESON, J. D. Food: Its Composition and Preparation. A textbook for classes in household science. By Mary T. Dowd and Jean D. Jameson, Teachers of Household Science, Washington Irving High School, New York City. 173 p. 12 mo. il. 1918. **$1.50**

Gives a clearer conception of the relation between the cost of foods and their nutritive value. An elaboration of the notes dictated by the authors to their own High School classes.

DRAPER, CHARLES H. Heat and the Principles of Thermodynamics. New and revised edition. 441 p. 8 vo. il. 1914. **$2.25**

The subject matter in this new edition has been revised and rewritten in order that the book may be in accord with the recent advances made in the methods of heat measurement and the theories brought to light by recent investigations.

CONTENTS. Units of measurement. Symbols. Formula. Experimental. Temperature. The thermometer. Expansion of solids, liquids, and gases. Remarks on expansion. Specific heat. Calorimetry. Liquefaction and solidification. Latent heat. Properties of vapors. Ebullition. Latent heat. Liquefaction of gases. Hygrometry. Heat and electricity. Conductivity. Thermochemistry. Radiation. Measurement of temperature. Principles of thermodynamics. Work and energy. Mechanical equivalent of heat. The Kinetic theory. Internal and external work. Isothermal Curves. Continuity of state. Specific heats of gases. Adiabatic changes and curves. Heat engines. Theory of heat engines. Some applications of Carnot's principles. Miscellaneous examples and exercises. Appendix. Answers to exercises.

DUBOSC, A., and LUTTRINGER, A. Rubber its production chemistry and synthesis in the light of recent research. A practical handbook for the use of rubber cultivators, chemists, economists and others. English edition by Edward W. Lewis. 383 p. 8 vo. 1918. **$6.50**

Brings together, with comments, scattered accounts from various journals, "some of which are not easy to procure." Section 1 deals with natural rubber, its statistics and costs, with chapters on resinous and reclaimed rubbers, section 2 with the formation, physical and chemical properties, analysis and constitution of crude rubber, section 3 (150 pages) with synthetic rubber. Many footnote references. A valuable list of patents on reclaimed rubber on pages 41-45.

DUERR, GEORGE and TURNBULL, WILLIAM. Bleaching and Calico-Printing. 158 p. 8 vo. 1896. (Dyed and printed patterns.) **$4.50**

This book is intended as a reliable and practicable guide to the young bleacher and calico printer. The subject is necessarily treated technically, yet the aim throughout has been to make it as clear, concise, and simple as is consistent with a thorough scientific explanation of the principles involved. Chemical equations are freely used for the purpose of illustrating methods of preparing the various mordants, dyestuffs, and other substances necessary for the production of the colors.

CONTENTS. Bleaching. Printing. Mordants. Styles of calico-printing. Thickeners. Natural organic coloring matters. Tannin matters. Oils, soaps, solvents. Organic acids, salts. Mineral colors and pigments. Coal tar colors. Dyeing. Water. Theory of colors. Index. Patterns.

DUMESNY, P., and NOYER, J. Wood Products, Distillates and Extracts. The chemical products of wood distillation, dyeing and tanning extracts from wood. 336 p. 4 to. 1913. **$5.00**

CONTENTS: The distillation of wood, Generalities, Principal methods of carbonizing or "coaling" wood; The acetic acid industry; Secondary products of wood distillation, Analysis of raw materials and finished products; Destructive distillation of olive oil residuals, Methyl alcohol; Table of density, The manufacture and testing of tan wood extracts and their utilization in modern tanneries, Chestnut wood extract, Plant and equipment for treating chestnut wood, specification of model type of an extract factory; Capital required etc.; Number and capacity of extract factories; Method of using chestnut wood extracts in tanning; Manufacture and use of oak wood extracts; Manufacture and use of quebracho and sumac extracts; Khaki substitute for quebracho and its use in tanning; Extract from various tanning substances; Their manufacture and uses; Divi-Divi; Valonia; Chinese galls, Myrobolam; Palmetto; Mimosa, Tara, Mangrove, etc.; Manufacture and use of logwood extract, Analysis of tanning substances, The official method of the International Association of Leather Chemistry; Appendix.

DUNBAR, W. P. Principles of Sewage Treatment. Translated with the author's sanction by H. T. Calvert, M.Sc., Ph.D., F.I.C. 271 p. 8 vo. il. 1908. **$5.00**

CONTENTS: Part I.—Historical development of the sewage problem. Growth of river pollution. Legal measures taken by central and local authorities. Rise and development of methods of sewage treatment. Earlier views on methods of sewage treatment—their object and utility.

Part II.—The present position of sewage treatment. The characteristics of sewage. Objects of purification works. Description of methods for the removal of suspended matters. Methods for the removal of putrescibility. The disinfection of sewage. Supervision and inspection of sewage disposal works. The utility and cost of the various methods of sewage treatment.

DUNCAN, J., and STARLING, S. G. Textbook of Physics for Students of Science and Engineering. 3 pts. in 1 vol. 1081 p. 8 vo. il. 1918. **$5.50**

Prepared to meet a demand for a text-book of physics which will connect more intimately the scientific aspects of physics with its modern practical applications.

CONTENTS: Dynamics. Heat. Light. Sound. Electricity and magnetism.

DUNN, F. B. Industrial Uses of Fuel Oil. 235 p. 8 vo. il. 1916. **$3.00**

Concise and practical, this work should be of service to engineers, architects, efficiency engineers, or others interested in the subject. Besides the chapters on the applicability of fuel oil to the glass, rubber, sugar, steel, and other industries, there is one devoted to domestic uses. The chapter on furnace efficiency describing how boiler losses may be checked and efficiency determined is noteworthy. Fully illustrated with many line drawings.

DUNSTAN, A. E., and THOLE, F. B. Viscosity of Liquids. (Monographs on inorganic and physical chemistry.) 91 p. 8 vo. il. 1914. **$1.60**

CONTENTS. Development of a working formula. Measurement of viscosity. Viscosity of liquid mixtures. Viscosity of electrolytic solutions. Viscosity of colloids. Relation between viscosity and chemical constitution. Some applications. References. Index.

DYKE, A. L. Automobile and Gasoline Engine Encyclopædia. Twelfth edition. 948 p. 46 il. 1920. **$6.00**

"Is not what one might term an encyclopædia in the true sense of the word, yet it is one of the most complete reference books on automobiles yet published, any subject, trouble, remedy or repair one might think of can be found in the 6,000 lines of index."

DYSON, S. S. A Manual of Chemical Plant. 8 vo. il. In thirteen parts. (Not sold separately.) Paper. 1921. In preparation.

A record of the practical outcome of research and experiment as embodied in the range of plant which is actually available for the carrying out of the operations and processes of industrial chemistry. The work therefore places in the hands of the chemical engineer, the chemical manufacturer, the chemical works manager, and the student of chemical technology the results of a long and patient examination of the claims of almost every new piece of chemical plant that has been introduced during the last twenty five years, together with an exhaustive analysis of the patent literature of the same.

DYSON, S. S., and CLARKSON, S. S. Chemical Works, Their Design, Erection, and Equipment. 220 p. 8 vo. il. 1912. **$9.00**

CONTENTS: Choice of site. Notes of materials used in construction. First principles in laying out a work. Arrangement of buildings; Stores, Workshops, The drainage system, Foundations, Retaining walls, Fire prevention, Ambulance arrangements. The power house; Boilers, Coal store, Automatic weighing machines; Chimney, Economizers, Steam engines, Steam turbines. Sulphuric acid plant; General design, Chambers, Glover tower, Gay Lussac tower, Notes on vitriol manufacture, Recent developments in vitriol plant design and working. Hydrochloric acid plant. Nitric acid plant. Notes on high explosives plant. Sulphate of ammonia plant. Notes on fertilizer plant. General plant. Appendix. On the chemical engineer. The saw mill and box making department. The alkali, etc., works regulations act. (a) Alkali works and alkali waste, (b) Sulphuric acid, muriatic acid and other specified works, (c) Regulation of works: Inspection; Special rules, Procedure. "Welfare work" or "Prosperity sharing."

EAKLE, ARTHUR S. Mineral Tables for the Determination of Minerals by Their Physical Properties. 73 p. 8 vo. 1904. **$1.50**

The tables include the common minerals and a few others of local prominence, usually considered as rare in occurrence. The minerals are arranged primarily according to streak and color, and under each color according to hardness.

ECKEL, EDWIN C. Building Stones and Clays. Their Origin, Characters, and Examination. 264 p. 37 il. 8 vo. 1912. **$3.00**

CONTENTS. Part I.—Building Stones. The origin and structure of rocks; Igneous rocks in general, Granites, Trap rock, Serpentine and soapstone, Sedimentary rocks, Slates, Sandstones, Limestones, Marbles; Field examinations and valuations, Laboratory testing of stone. Part II.—Clays. General classification, Residual clays, Transported clays; Distribution of Clays, Field examination of clay deposits.

ECKEL, EDWIN C. Iron Ores. Their Occurrence, Valuation and Control. By Edwin C. Eckel, Associate, Am. Soc. C. E.; Fellow, Geol. Soc. of America. 427 p. 8 vo. 1914. **$4.00**

A discussion of iron ores not only in their geologic and technical relations but in their more general relations to industrial conditions. Emphasis is laid on the origin of the deposits, the valuation of iron ore properties, mining conditions and costs, the world's deposits of ores, and the extent and control of reserves.

CONTENTS. Introductory. Chapter I.—The industrial status of iron. Part I.—The origin of iron ore deposits. II.—The geologic and chemical relations of iron. III. The iron minerals and their relationships. IV.—The formation of iron ore deposits. V.—Sedimentary or bedded deposits. VI.—Replacements and cavity fillings. VII.—Alteration deposits. VIII.—Igneous iron deposits. Part II.—The valuation of iron ore deposits. IX.—Basal factors in ore valuation. X.—Prospecting and tonnage determinations. XI. Mining conditions and costs. XII.—Furnace and mill requirements. XIII. Composition and concentration of iron ores. XIV.—Ore prices, profits and markets. XV.—The effect of time on valuation. Part III.—The iron ores of the world. XVI.—Iron ores of the United States, General; XVII.—The Lake Superior district. XVIII.—The southern United States. XIX.—The northeastern United States. XX.—The western United States. XXI.—Newfoundland and Canada. XXII.—West Indies, Mexico and Central America. XXIII.—South America. XXIV.—Europe. XXV.—Asia, Africa and Australia. Part IV.—Extent and control of iron ore reserves. XXVI.—The extent of American ore reserves. XXVII.—Probable duration of American reserves. XXVIII.—Ownership and control of American reserves. XXIX.—Ire ore reserves of the world. XXX.—World competition in iron and steel. XXXI.—Questions of public policy. XXXII.—Questions of private policy.

EDELMAN, PHILIP E. Inventions and Patents. 300 p. 12 mo. 1915. **$2.00**

A broad general exposition, in simple terms, of the procedure in the patent office and of the possibilities in patented inventions. Contains much information valuable to inventors, investors and manufacturers.

CONTENTS: Development of the Patent Office system. The Patent Office. Patent attorneys. The germs of invention. The field of invention. Preliminary steps to secure a patent. Patentability and practicability. Application for and prosecution of a patent. Protecting an invention. Points of patent procedure. Patent rights and how they are utilized. Disposing of patent rights. About infringements. Points about foreign patents. Thoughts on inventions and inventors. The present status of inventions. Memoranda. Appendix.

EDWARDS, C. A. The Physico-Chemical Properties of Steel. 229 p. 8 vo. il. 1916. $6.00

A comprehensive account of the chemical and structural constitution of steels, describing the internal changes that occur when steels are heated and cooled under varying conditions and indicating the effect of those conditions upon the properties of the material places the study of steel upon a sound scientific basis. All the important phases dealing with the metallography of steel are thus put in a condensed form.

Contents. Constitution of metallic systems. Structure of metals. Iron. Constitution of the iron carbon system. Micro structure of iron carbon steels. Solidification of steel ingots. Iron carbon steels phosphorus. Sulphur. Burning and overheating of steel. Deformation and strain hardening of metals. The properties of cold drawn wire and the effect of acid cleaning. Cementation and case hardening. Theories of hardening by quenching. Special steels. Tungsten carbon steel. High speed tool steel. Manganese, chromium, aluminium, silicon, and vanadium steels. Structural constitution of special Ternary steels. Index to authors cited. Index to subjects.

EFFRONT, J. Biochemical Catalysts in Life and Industry. Proteolytic Enzymes. By Jean Effront, Professor in the New University and Director of the Institute of Fermentations of Brussels. Translated by Samuel C. Prescott, Professor of Industrial Microbiology, Massachusetts Institute of Technology. Assisted by Charles S. Venable. 752 p. 8 vo. 1917. $6.00

In this volume the author has occupied himself exclusively with the catalysts for nitrogenous substances. The chemist will find in this book data on all the proteolytic enzymes. The book also describes the different anti-enzymes known as anti-rennet, antipepsin, etc., and shows how the formation of all these substances results from the same principles, that of vital defense.

Summary of Contents: Introduction. Part I.—Coagulating Enzymes. Thrombin. Myosinase. Rennet. Part II. Pepsin. History, distribution, preparation and chemistry. Reversible action of enzymes. Plasteins. Part III.—Trypsin. Pancreatic trypsins. Functioning of digestive gland. Trypsins of various origins. Antigens, antibodies. Complement. Part IV.—Intestinal Erepsin. Peptolytic enzymes. Enzymes of the nuclei. Proteins. Arginase. Creatino-creatase, creatase, creatinase. Part V.—Amidases. Part VI.—Applications.

EFFRONT, J. Enzymes and Their Application. By Dr. Jean Effront. English translation by Professor Samuel C. Prescott. 322 p. 8 vo. $3.00

Contents: General properties. Manner of action of diastases. Individuality of enzymes. Sucrase. Fermentation of molasses. Amylase. Industrial applications of amylase. Maltose. Pavary fermentation. Rôle of amylase in the distillery. Quantitative study of malt. Maltase. Industrial applications of maltase. Enzymes of carbohydrates. Ferments of glycerides and glucosides. Zymase. Oxidases.

EISSLER, MANUAL. High Explosives. Nitroglycerin and Dynamite: Their manufacture, use, and application to mining and military engineering. Pyroxylin, or gun-cotton, fulminates, picrates and chlorates. Third edition. 406 p. 8 vo. 1914. $4.00

Contents: Chemistry and analysis of various bodies which enter into the manufacture of the high explosives; Nitro-glycerine: Its manufacture, chemical and physical properties; The various high explosives prepared with nitro-glycerine, and their properties; Other varieties of high explosives; Pyroxyline, gun-cotton, nitro-cellulose; Fulminating compounds; Analysis of nitro-glycerine compounds; Directions for using the high explosives; Electricity as applied to blasting operations; Principles of blasting force and effect of explosive bodies; Mining and engineering problems; Large mines; Destruction of walls, obstructions to navigation, iron plates, and cannons; The application of high explosives in agriculture; blasting of trees, grubbing of stumps, blasting of piles; Submarine mines, The application of the high explosives for military purposes; Appendix; Questions relating to the preservation of nitro-glycerine compounds; Proofs of stability; Dynamite with nitrate of ammonium base; Nitro-gelatine; Gut-cotton; The qualities of explosive bodies; Explosions by influence; The origin of the nitrates.

EKELEY, JOHN B. A Laboratory Manual of Inorganic Chemistry. 128 p. 8 vo. 46 il. 1912. $1.25

Comprises a series of experiments covering the subject matter of Professor Holleman's "Text Book of Inorganic Chemistry." Arranged for the use of beginners in and teachers of chemistry.

ELDRIDGE, A. A., and BRISCOE, H. V. A. First Aid in the Laboratory and Workshop. By Arthur A. Eldridge, B.Sc., and H. V. A. Briscoe, B.Sc., Demonstrators in Chemistry, Imperial College of Science and Technology. With a foreword by Surg. General Sir Alfred Keough, K.C.B. 32 p. 8 vo. 1915. $0.45

ELIOT, C. W., and STORER, F. H. Compendious Manual of Qualitative Chemical Analysis. As revised by W. R. Nichols. Newly revised by W. B. Lindsay and F. H. Storer. Twenty-second edition. 209 p. 12 mo. 1920. $1.50

Contents: Definition and Scope of Qualitative Analysis; Examples of the Separation; Chlorides Insoluble in Water and Acids; Sulphides Insoluble in Water, Dilute Acids and Alkalies; General and Special Tests for Non-Metallic Elements; Treatment of Substances of Unknown Composition; Reagents; Solutions of Known Composition; Utensils.

ELLIS, CARLETON. The Hydrogenation of Oils, Catalyzers and Catalysis, and the Generation of Hydrogen. New enlarged edition. 700 p. 8 vo. il. 1919. $7.50

Contents: Methods of hydrogenation; Catalyzers and their rôle in hydrogenation processes; The base metals as catalyzers; Nickel carbonyl; The rare metals as catalyzers; The occlusion of hydrogen and the mechanism of hydrogen addition; The analytical constants of hydrogenated oils; Edible hydrogenated oils; Uses of hydrogenated oils and their utilization in soap making; Hydrogenation practice; The hydrogen problem in oil hardening; Water gas as a source of hydrogen and the replacement of carbon monoxide by hydrogen; Liquefaction and other methods for the removal of carbon dioxide; Hydrogen by the decomposition of hydrocarbons; Hydrogen by the action of steam on heated metals; Action of acids on metals; Miscellaneous methods of hydrogen generation; Hydrogen by the electrolysis of water; safety devices; Appendix.

Heretofore the literature on hydrogenation has been scattered through many periodicals, and, except for a few condensed briefs, has not found its way into book form. In this work the author has collected and arranged in logical order all the known facts and figures of this important new branch of chemistry. The treatise describes the numerous processes proposed for the treatment of various oils with hydrogen, and gives many details of operation on the large scale. The catalytic materials employed and the manner of preparation are discussed fully, and all useful methods of generating hydrogen gas are detailed. The publication is one which should be of great interest to workers in fatty and petroleum oils, and in fact in all arts where the treatment of unsaturated organic compounds is involved.

ELLIS, CARLETON, and MEIGS, JOSEPH V. Gasoline and Other Motor Fuels. 728 p. 8 vo. 206 il. 2 folding plates. 1921. $10.00

A complete survey of the field, giving a description of practically every process of making gasoline and most other motor fuels of promise or prominence.

Contents: Introduction; Mixed fuels; Gasoline refinery; Practice; Refining methods, Sulphur removal; Chemical treatment, Distillation, Forwood's processes; Distillation under pressure; Cracking in stills under pressure; The Burton process, Coast's processes; Cracking heavy oils in the liquid state or phase; Tube and retort cracking in the vapor phase; Hall's processes and methods, The Rittman process; Processes using steam; Cracking in the presence of hydrogen, hydrocarbon and other gases; Chemical methods of cracking oils; Cracking and distilling by means of fused baths and indirect heating means, The testing of motor fuels; Cracking with the aid of internal heat; cracking by electrical methods; The condensation of hydrocarbons from gases; Benzol. Use as motor fuel and manufacture; Alcohol as motor fuel, Shale as a source of motor fuel; The pyrogenetic treatment of asphalt; Appendix; Statistics on petroleum products, The coke industry in 1919.

ELLMS, J. W. Water Purification. By Joseph W. Ellms, Mem. Am. Soc. C.E.; Am. Chem. Soc.; Am. Public Health Assn., and New England W. W. Assn. 485 p. 8 vo. 1917. $6.00

A comprehensive treatment of the whole subject of water purification, by a man who is widely known for his work in this field, and who has been closely identified with the development of the science through many years.

The design, construction, equipment and operation of filtration plants are fully covered. Costs, both of construction and operation, are given.

EMERY, FREDERIC B. Elementary Chemistry. 666 p. 12 mo. il. 1909. $1.50

Contents: General description; Introductory; Description of non-metallic elements and their compounds; Description of metallic elements and their compounds; Organic compounds; Mathematical; Experimental.

EMMONS, WILLIAM HARVEY. Geology of Petroleum. 624 p. 8 vo. 254 maps and illustrations. 1921. $6.00

This book presents a perspective of the geology of petroleum. It is intended as a textbook for students and also as a manual for the practising geologist who is undertaking the study of a field new to him. It is a concise discussion of the origin, occurrence, accumulation, and distribution of oil and gas. It includes the salient facts relating to the geology of the world's principal oil fields, with references to literature that describes them in detail.

Contents: 1. Geographic and geologic distribution of petroleum; 2. Surface indications of petroleum and gas; 3. Openings in rocks; 4. Association of petroleum and salt water; 5. Reservoir rocks and covering strata; 6. Properties of petroleum; 7. Origin of petroleum and gas; 8. Map making and log interpretation; 9. Accumulation of petroleum; 10. Structural features of oil and gas reservoirs; 11. Deformation of petroliferous strata; 12. Metamorphism of petroleum by dynamic agencies; 13. Gas pressure, oil recovery, and behavior of oil wells; 14. Petroliferous provinces and petroleogenic epochs; 15. Appalachian, Lima-Indiana, and Michigan fields; 16. Illinois fields; 17. Mid-Continent fields; 18. Prospects in Mississippi, Alabama, and Georgia; 19. Coast fields of Texas and Louisiana; 20. Rocky Mountain fields; 21. Pacific Coast fields of California and Alaska; 22. Canada and Newfoundland; 23. Mexico; 24. Europe, except Russia; 25. Russia, Mesopotamia, Persia, and Egypt; 26. Burma and Oceanica; 27. Caribbean Islands; 28. South America.

EMMONS, W. H. The Principles of Economic Geology. By William Harvey Emmons, Ph.D., Professor and Head of Department of Geology and Mineralogy, University of Minnesota; Director Minnesota Geological Survey; formerly Geologist, Section of Metalliferous Deposits, United States Geological Survey. 612 p. 8 vo. il. 1918. $5.00

A presentation of the science of metalliferous and non-metalliferous deposits for advanced students of geology. The first part of the book is a general treatment of mineral deposits. The second part is a treatment of each of the metals and of the more valuable non-metallic minerals. Numerous mining districts and their deposits, chosen as far as practicable from North America, are described. Mineral fuels are not included.

Contents: Chapter I.—Introduction. II.—Classification of ore deposits. III.—Deposits formed by magnetic segregation. IV.—Pegmatite deposits. V.—Contact metamorphic deposits. VI.—Deposits of the deep vein zone. VII.—Deposits formed at moderate depths by hot solutions. VIII.—Deposits formed at shallow depths by hot solutions. IX.—Deposits formed at moderate and shallow depths by cold meteoric solutions. X.—Sedimentary deposits. XI.—Primary ore shoots. XII.—Deformation of ore deposits. XIII.—Faulting and folding of ore deposits. XIV.—Dynamic metamorphism of ore deposits. XV.—Superficial alternation and enrichment of ore deposits. XVI.—Openings in rocks. XVII.—Structural features of openings in rocks and of epigenetic deposits. XVIII.—Metasomatic processes. XIX.—Mineral associations in veins and wall rock alterations. XX.—Metallogenic provinces and metallogenic epochs. XXI.—Composition and source of ascending thermal metalliferous water. XXII.—Iron. XXIII.—Copper. XXIV.—Gold. XXV.—Silver. XXVI.—Zinc and lead. XXVII.—Miscellaneous metalliferous deposits. XXVIII.—Deposits of the non-metals.

ENGELHARDT, V. The Electrolysis of Water. By Viktor Engelhardt, Chief Engineer and Chemist of the Siemens & Halske Co., Limited, Vienna. Authorized English Translation by Joseph W. Richards, M.A., A.C., Ph. D., President of

the American Electro-Chemical Society, Professor of Metallurgy at Lehigh University. 140 p. 8 vo. il. **$1.50**

Contents: I.—Historical review. II—The constants of the electrolytic decomposition of water. III.—Review of the processes. IV.—Applications. V.—Appendix.

ENNIS, WILLIAM D. Applied Thermodynamics for Engineers. Fourth edition, corrected. 514 p. 8 vo. il. 1915. **$5.00**

Contents: The nature and effects of heat. The heat unit Specific heat. First law of thermodynamics. Laws of gases Absolute temperature. The perfect gas. Thermal capacities. Specific heats of gases. Joule's law. Grapical representations. The Carnot cycle. The second law of thermodynamics Entropy Compressed air Hot air engines. Gas power. Theory of vapors. The steam engine Modified cycle. Multiple expansion. Engine testing The steam turbine. Results of trials of engines and turbines. The steam power plant Distillation. Fusion. Liquefaction of gases. Mechanical refrigeration

The subject is treated as related to its engineering applications Differential equations have been almost wholly eliminated, the mathematical complications have been as far as possible avoided, and the rule has been kept in mind to employ the calculus only in the few places where it really makes things simpler

ENNIS, WILLIAM D. Linseed Oil and Other Seed Oils. An industrial manual. 330 p. 8 vo. il. **$5.00**

Contents: Introductory. The handling of seed and the disposition of its impurities. Grinding. Tempering the ground seed and moulding the press cake Pressing and trimming the cakes. Hydraulic operative equipment The treatment of the oil from the press to the consumer. Preparation of the cake for the market Oil yield and output. Shrinkage in production Cost of production Operation and equipment of typical mills. Other methods of manufacturing The seed crop. The seed trade Chemical characteristics of linseed oil. Boiled oil Refined and special oils. The linseed oil market. The feeding of oil cake. Miscellaneous seed oils. The cotton seed industry. Glossary.

ERMEN, W. F. A. The Materials Used in Sizing. Their chemical and physical properties, and simple methods for their technical analysis and valuation. 130 p. 12 mo. **$2.00**

Contents: The starches and other agglutinants; Weighting materials; Softening ingredients; Antiseptics; Analysis of sized wraps and cloth; The preparation of normal volumetric solutions, Tables.

EVANS, E. A. Lubricating and Allied Oils. 128 p. il. 8 vo. 1921. **$4.00**

Contents: History of petroleum; Oil refining; Occurrence of fatty oils; Physical tests; Chemical tests; Oxidation of petroleum; Oleography; Selection of lubricants; Oils employed, Appendix, Index.

EWING, J. A. Mechanical Production of Cold. 204 p. 8 vo. Second edition. 1921. **$8.00**

Contents: General Principles of refrigeration; Air machines; Absorption machines; The Vapor compression process, Trials of refrigerating machines; Uses of mechanical refrigeration; Application of extreme cold; Appendices.

FAIRIE, J. Notes on Pottery Clays. The distribution, properties, uses and analysis of ball clays, china clays and china stone. With tables and formulas. 135 p. 12 mo. 1901. **$2.00**

Contents: Properties of clays; Brick, Fire, Pottery; Pipe, Dorsetshire and Devonshire; Keohn or china; Cornish china, Analysis of clays, Preparation of clays; Sources of Irish porcelain clays; China stone, its discovery, use, composition, occurrence and analysis.

FALK, K. GEORGE. Chemical Reactions: Their Theory and Mechanism. 220 p. 8 vo. 1920. **$2.50**

Contents: Introduction; Valence; Co-ordination number; Acids and bases; Catalysis; Chemical reactions, general considerations, Some chemical reactions; Olefins and their reaction products; Oxidation-reduction; Some oxidation reduction reactions.

FALK, K. GEORGE. The Chemistry of Enzyme Actions. 136 p. 8 vo. American Chemical Society Monograph. 1921. **$2.50**

Contents: Introduction; Velocities of Chemical Reactions; General Theory of Chemical Reactions; Catalysis; Chemical Reactions Catalyzed by Enzymes; Physical Properties Common to Enzyme Preparations; Chemical Properties Common to Enzyme Preparations; Chemical Nature of Certain Enzymes; Mechanism of Enzyme Actions, Uses and Applications of Enzymes; Present Status of Enzyme Problem.

FARMER, F. M. Electrical Measurements in Practice. By F. Malcolm Farmer, Chief Engineer, Electrical Testing Laboratories (New York); Fellow A. I. E. E.; Mem. A. S. M. E., etc. 360 p. 8 vo. il. 1917. **$4.50**

A presentation from the standpoint of engineers who are actively engaged in making measurements, tests and investigations in the electrical industry. The author has aimed to develop a simple, practical discussion, avoiding the highly theoretical point of view. Instruments form a prominent part of the discussion, but detailed descriptive matter pertaining to commercial instruments has been limited to those in most general use.

Contents: I.—Introduction. II.—Galvanometers. III—Continuous E m.f. measurements. IV.—Continuous current measurements. V.—Alternating E m f. measurements. VI.—Alternating current measurements. VII.—Resistance, reactance and impedance measurements. VIII.—Power measurements. IX.—Energy measurements. X.—Maximum demand instruments. XI.—Inductance measurements. XII.—Capacitance measurements. XIII—Frequency and slip measurements. XIV.—Wave-form determinations. XV.—Magnetic measurements. XVI.—Curve-drawing instruments.

FARRELL, FRANK J. Dyeing and Cleaning: A practical handbook. Third edition, 253 p. 12 mo. il. **$2.00**

This book justifies the sub-title, more attention being paid to the general principles which govern the methods employed than to minute working details. The latter are superfluous to the practical man, and of little value to the beginner.

Contents: Technology of the textile fibres. Dry cleaning. Wet cleaning. Dyeing. Dry cleaning. Special methods—cleaning and dyeing skin rugs, feathers, and hats, Finishing. Reprint from Lancet on adulteration of fabrics. Memorandum issued by Incorporated Association of London Dyers and Cleaners on adulteration of dress silks. Useful tables. Nomenclature of stable hydrosulphites. Summary from Red Book No. 133. Index.

FARRINGTON, E. H., and WOLL, F. W. Testing Milk and Its Products; a manual for dairy students, creamery and cheese factory operators, food chemists and dairy farmers. 23d edition, revised and enlarged. 297 p. 12 mo. il. 1916. **$1.25**

FAY, C. H. The Art of Lead Burning. 144 p. 8 vo. il. 1918. **$2.00**

Reprint from "The Metal Worker, Plumber and Steam Fitter." The only treatise dealing exclusively with the subject.

FAY, HENRY. Microscopic Examination of Steel. 86 p. 8 vo. il. 1917. **$1.50**

Author is Professor of analytical chemistry in the Massachusetts Institute of Technology and consulting engineer to the Watertown Arsenal. There are 18 pages of text, including brief directions for polishing and etching as well as a short list of books, also a number of photographic reproductions on heavy plate paper

"A reprint of material originally published by the U. S Ordnance Department, representing the results of investigations at the Watertown Arsenal. The text is very brief and to the point, and the photographs are very good. It is a mere outline of metallographic methods illustrated by typical examples, and is intended particularly to help learners or workers in metallography who need some precise advice and instruction in the interpretation of results It is admirably suited to serve this end, within the limits imposed"- *Metallurgical and chemical engineering, May 1, 1917.*

FAY, HENRY. Quantitative Analysis. 111 p. 8 vo. il. 1917. **$1.50**

Contents. Part I Mineral Analysis Sampling; Determination of silica, potassium and sodium in silicates, Analysis of spathic iron ore; Determination of sulphur in pyrite, of titanium in titanium iron ore, Iodometric determination of copper, proximate analysis of coal Part II—Metal Analysis. Analysis of phosphor bronze; Determination in steel of carbon, manganese, phosphorus, sulphur, copper, nickel, chromium, tungsten, vanadium, Determination of sulphur and silicon in cast iron; Atomic weights, Logarithmic tables

FAY, IRVING W. The Chemistry of Coal-Tar Dyes. Second edition, revised and enlarged. 508 p. 8 vo. 1918. **$5.00**

(Author is professor of chemistry at Polytechnic Institute, Brooklyn.)

Contents: Coal tar and its products. The hydrocarbons and their derivatives. The nitro and nitroso dyes. The triphenylmethane dyes. Classification of the coal tar dyes Azo dyes. Seven Food colors Pyronines Indomines, indophenols, thiazines, oxazines Eurhodines and safranines. Quinoxiline, quinoline and acridine dyes. Aniline black Alizarin dyestuffs. Indigo. Sulphur dyes. Mordants. Experimental work.

Intended for those dyers who have a good knowledge of general chemistry, and some knowledge of organic chemistry. The methods of making the dyes are taken up, followed by a study of the relations of the great classes of dyes, and also the individual dyes themselves, to one another in the same class. The development of one color from another by a change in its composition is explained, and tables showing the variation of color accompanying change of composition are included.

FERNALD, R. H., and ORROK, G. A. Engineering of Power Plants. By Robert H. Fernald, M.E., A.M., Ph.D., Whitney Professor of Dynamical Engineering, University of Pennsylvania, and George A. Orrok, M.E., formerly Mechanical Engineer, New York Edison Company, 581 p. 8 vo. il. 1916. **$5.00**

A combination of material that has been developed during consulting practice and teaching. It aims, as a textbook (1) to emphasize that engineering, although based on the exact sciences, is not itself an exact science but requires, on the part of the successful engineer, a natural fund of "common sense" and the application of engineering judgments; (2) to give the student some understanding of the commercial side of engineering. It is an important reference work for practicing engineers

Contents: I.—Sources of energy. II—The steam engine. III.—Electric generators and motors IV.—Foundations. V.—Condensers. VI—The steam boiler. VII—Chimneys and mechanical draft. VIII.—Smoke and smoke prevention. IX.—Boiler auxiliaries. X.—Piping. XI—Coal and ash handling XII.—The steam power plant. XIII.—Variable load economy. XIV—Cost of power. XV.—Hints on steam plant operation. XVI—Power transmission XVII—District heating. XVIII—The power plant of the tall office building. XIX.—The power plant of the steam locomotive XX—Fuels XXI—Internal combustion engines. XXII.—Producer gas and gas producers. XXIII.—Comparative efficiencies and operating costs for different types of installations. XXIV.—Compressed air XXV.—Refrigerating machinery. XXVI.—Hydraulic power.

FERNBACH, R. L. Glues and Gelatine, a practical treatise on the methods of testing and use. 208 p. 8 vo. 1907. **$3.00**

Contents: Introductory. Classification and testing of glues. Analysis of glues and gelatine Glue and gelatine substitutes. Foreign glues. Selection of glues for various industries How glue should be used Commercial and legal aspects. Manufacturing receipts. Analytical methods. Appendix.

FERRY, ERVIN S. A Handbook of Physics Measurements. By Ervin S. Ferry, Professor of Physics, Purdue University, in collaboration with O. W. Silvey, C W. Sherman, Jr., and D. C. Duncan. Vol. I Fundamental Measurements, Properties of Matter and Optics 251 p. 8 vo. 146 figures. 1918. **$2.00**

Furnishes the student of pure or applied science with a self-contained manual of the theory and manipulation of those measurements which bear most directly upon his subsequent work in other studies and upon his future professional career.

Contents of Vol. I: I General notions regarding physics measurements; II. Fundamental measurements and the properties of matter; III. Optics. Tables: 1. Conversion factors; 2. Densities of solids and liquids; 3. Specific gravities of water at different temperatures; 4. Specific gravities of aqueous solutions of alcohol; 5. Specific gravities of aqueous solutions at 15° C.; 6. Reduction of arbitrary hydrometer scales; 7. Specific gravities of gases and vapors; 8. Coefficients of friction; 9.

Elastic constants of solids; 10. Viscosities of water and aqueous sugar solutions; 11 The Greek alphabet; 12. Factor for reducing the volumes of a gas saturated with water vapor, and at various temperatures and pressures, to the volume at 30 inches of Mercury and 60° F; 13. Values of $\sin^2\theta$ and $\cos^2\theta$; 14 Absolute index of refraction of various substances for the D line; 15. Index of refraction and dispersion of optical glasses, 16 Wave lengths of the prominent lines of the visible solar spectrum.

Vol. II. Vibratory Motion, Sound, Heat, Electricity and Magnetism. 233 p. 8 vo. 128 figures. Cloth. net, $2.00

This book treats the measurements in the most available form for college and industrial laboratories The mechanical engineer will be especially interested in the methods for the determination of the economy effected by steam-pipe coverings, and the thermal value of coal and gas

Contents of Vol. II Vibratory motion, Sound, heat, electricity and magnetism Appendix The sum of the series $\cos x + \cos 2x + \cos 3x +$. Tables: The Greek alphabet, Corrections for the influence of gravity on the height of a barometer, Boiling point of water under different barometric pressures, Pressure of saturated aqueous vapor, Pressure of saturated mercury vapor, Coefficients of linear expansion of solids; Coefficients of cubical expansion of liquids, Heat values of various fuels, Specific heats of solids and liquids; Melting points and heat equivalents of fusion, Boiling points and heat equivalents of vaporization

FERRY, ERVIN S., and others. Practical Pyrometry; the theory, calibration and use of instruments for the measurement of high temperatures by Ervin S. Ferry, Glenn A. Shook, and Jacob R. Collins. 147 p. 8 vo. il. 1917. $1.50

A three years' testing of various methods and apparatus led to the organization of a course in high temperature measurements for students of chemical engineering at Purdue University The present volume, based upon the notes used, is so arranged as to be of use not only to college students and to the technical expert, but to the less trained man who makes the measurements in practice.

Contents. Standard temperature scales. Resistance pyrometry. Thermoelectric pyrometry Radiation pyrometry. Optical pyrometry.

FERRY, ERVIN S. General Physics and Its Application to Industry and Everyday Life. Part I Dynamics, Sound and Heat. 687 problems, 600 figures. 652 p. 8 vo 1921. $4.00

Designed for students who early in their college career require a co-ordinated elementary course in fundamental principles, methods and industrial applications of physics No knowledge or mathematics is assumed beyond the elements of algebra and trigonometry

Contents: Dynamics; Fundamental notions of dynamics, Forces; Friction between solids; Motion of a body under the action of zero force; Motion of a body under the action of a constant force; Motion of a body under the action of a constant torque; Energy; Fluids, Properties of matter; Motion of a body under the action of a variable force; Wave motion; Sound, The nature of sound; Sounding bodies, Heat; Effects of heat; Convection and conduction, Thermodynamics.

FIERZ, HANS E. Basic Operations of Dyestuff Chemistry. About 325 p. 8 vo. il. In preparation. $6.00

Contents: Intermediates; Sulfonation; Nitration and reduction, Chlorination; Oxydation, Condensation; Dyestuffs; Azo dyestuffs, Triphenylmethane dyestuffs; Sulfur fusions; Various dyestuffs, Resume of various methods; Vacuum distillation in the laboratory and in the plant, Construction and use of autoclaves; Material of construction used in dyestuff production; Technical notes on plant operation, calculations; Analysis; Index.

FINDLAY, ALEXANDER. Chemistry in the Service of Man. By Alexander Findlay, M.A., D.Sc., Professor of Chemistry, University of Wales. Second edition. 288 p. 8 vo. il. 1917. $3.75

Contents: Introduction; Combustion and the production of fire, The chemistry of illuminants, Energy, fuel, and explosives, Cellulose and cellulose products, Velocity of reactions and catalysis, Fixation of atmospheric nitrogen; Glass, soda, soap; Electricity and chemistry, The colloidal state; Molecular structure, Synthetic chemistry, Fermentation and enzyme action; Index.

FINDLAY, ALEXANDER. Osmotic Pressure. (Monographs on inorganic and physical chemistry.) 1910. $2.25

Contents: Semi-permeable membranes and osmotic pressures. Van't Hoff's theory of dilute solutions. Direct determination of the osmotic pressure of concentrated solutions. Discussion of the recent determinations of osmotic pressure and of the Van't Hoff theory General theory of solutions. Discussion of the osmotic pressure of cane sugar Indirect determination of the osmotic pressure. Bibliography. Index.

FINDLAY, ALEXANDER. The Treasures of Coal-tar. 137 p. 12 mo. il. 1917. $2.00

Contents: The production of coal-tar; The distillation of coal-tar; The constituents of coal tar and their applications in the raw state; Molecular architecture, The production of dyes from coal tar, Azo dyes; Anthracene dyes and vat dyes; Indigo and its derivatives; Drugs, perfumes, and photographic developers; Explosives.

FINK, COLIN G. The Corrosion of Alloys. American Chemical Society Monograph. Ready about October 15th, 1921.

FINLAY, JAMES RALPH. The Cost of Mining. By James Ralph Finlay, Mining Engineer; Past Secretary and President, Mining and Metallurgical Society of America; Consulting Engineer, U S. Bureau of Mines. Completely rewritten Third edition. 532 p. 8 vo. il. 1920. $6.00

A discussion of the production of minerals, including a treatment of the geologic, social and economic foundations upon which this production rests.

Contents: I. The source of power; II. Value of mining property; III. Nature and use of capital; IV Factors governing variations of cost; V. Partial and complete costs; VI Coal; VII. Cost of mining coal; VIII. Industrial clearing houses and statistics of iron production; IX. Lake Superior iron—Old Ranges; X Cost of mining Lake Superior Iron, Mesabi Range, and U. S. Steel; XI. Occurrence, production and prospects of copper; XII. Southwest copper field; XIII. Jerome and the Pre-Cambrian; XIV. Lake Superior copper mines; XV. Bisbee; XVI. The Porphyry coppers; XVII. Northwestern copper field; XVIII. Copper mines in various districts; XIX. Lead; XX. Southeast Missouri; XXI. Silver-Lead mining; XXII. Cost of silver-lead smelting; XXIII. Zinc statistics; XXIV. Zinc mining; XXV. Gold statistics, wars and prices; XXVI. Occurrences and production of gold; XXVII. Quartz-Pyrite gold mines; XXVIII. Cripple Creek, Kalgoorlie and Goldfield, XXIX. Silver mining at Cobalt and Guanajuato.

FISCHER, EMIL. Introduction to the Preparation of Organic Compounds. Translated, with the author's sanction, from the new (eighth) German edition by R. V. Stanford. 194 p. *12 mo.* $1.50

Contents: Part I.—Nitrobenzene. Aniline. Acetanilide. Thiocarbonilide. Phenyl mustard-oil. β-Phenylhydroxylamine. Nitrosobenzine. Ethyl benzoate. *meta*-brombenzoic acid. Benzoyl chloride Benzamide. Diazobenzene nitrate. Diazoamidobenzene. Amidoazobenzine Sulphanilic acid. Diazobenzenesulphonic acid. Helianthin Phenyl hydrazine. Benzonitrile. Monoethylaniline. Nitrosodi-methyl aniline Hydrazobenzene and benzidine. Ethyl iodide. Aldehyde and aldehyde ammonia Ethylene bromide Glycol. Methylamine. Benzyl chloride. Benzaldehyde. Benzyl alcohol. Benzoin. Benzil. Benzilic acid Cinnamic acid. Hydrocinnamic acid Hexahydrobenzene Acetoacetic ester. Diacetosuccinic ester. Diethyl malonate. Benzylmalonic ester Benzylmalonic acid. Terephthalic acid. Pyruvic acid. Epichlorhydrin Acrolein *ortho-* and *para*-nitrophenol Picric acid Anisole. Quinone and hydroquinone Salicylic aldehyde. β-Naphthalene sulphonic acid β-Naphthol. Naphthalene from naphthol (distillation with zinc dust). Potassium cyanate and urea. Alloxan and alloxatine Quinoline Hydrocollidine and collidine dicarboxylic esters α-Methylindal (methylketol). Diphenyl Benzoylacetone Benzophenone Benzophenone oxime Phenanthrene-quinone Triphenylmethane. Triphenyl carbinol. Malachite-green Fluorescein and eosin Anthraquinone Alizarine. Camphor oxime. Part II.—Furfurol Grape-sugar. Mannose. Gluconic acid Phenylhydrazide of gluconic acid Saccharic acid. Mucic acid. α-Glucoheptonic acid α-Glucoheptose. Dulcitol. α-Methyl glucoside. Glucosamine hydrochloride Leucine Phenylalanine. Tyrosine. Cystine β-Naphthalene sulphoglycine Glycocoll ester and glycine-anhydride. Leucyl glycine β-Alanine and glycocoll esterhydrochloride. Approximate concentration of reagents.

The preparation of 90 compounds are shown, and these have been selected because of their practical nature, such as the cost of materials and apparatus, the easiness, shortness and freedom from danger of the operations.

FISHER, HARRY L. Laboratory Manual of Organic Chemistry. 331 p. 8 vo. 1920. $2.25

Contents: Part I. 66 Laboratory Experiments Part II Organic Combustions. Division A: The Determination of Carbon and Hydrogen Division B: The Determination of Nitrogen Nitrogen Tables. Logarithms.

FISCHER, MARTIN H. The Colloid Chemistry of Soaps and Soap Manufacture. By Martin H. Fischer, Doctor of Medicine, Eichberg Professor of Physiology in the University of Cincinnati. 272 p. 8 vo il. 1921. $4.00

Contents: The argument, Soap making; The system soap-water, The system soap-alcohol, Theory of the soap colloids, On the reaction of soaps to indicators, On the physical state of soap mixtures; On reversibility in soaps; On the analogy between the behavior of soaps and the behavior of certain proteins; The salting out of soaps, Definition of swelling, gelation, solution, separation and coagulation in colloid systems, The emulsifying and washing properties of soaps, Fillers for soaps, Filtration through soaps; Principles of hot and cold process soap manufacture

FLANDERS, WILLIAM THOMAS, and others. Galvanizing and Tinning; a practical treatise on the coating of metal with zinc and tin by the hot dripping, electro galvanizing, sherardizing and metal spraying processes, with information on design, installation and equipment of plants. 350 p. 8 vo. Third edition. 1921. $4.00

It is stated that the author has had the cooperation of seven well known experts who were broadminded enough to put the needs of the trade above their personal desire for gain through secrecy. An exceptionally complete and practical work for those engaged in the shop, or in preparing plans for new plants. Has a good trade directory.

FLEMMING, LOUIS ANDREW. Practical Tanning; a handbook of modern processes, receipts, and suggestions for the treatments of hides, skins and pelts of every description, including various patents relating to tanning, with specifications. Third edition. 594 p. 8 vo. 1916. $6.00

A thorough revision of this well known work. Although the trade papers have been freely drawn upon, it is stated that nothing is contained which has previously appeared in the books of other English or American authors Thoroughly practical, it aims "to give the details of tanning processes with such clearness and precision that nothing further in the way of explanation is required."

Contents: Section I.—The manufacture of sheepskin leathers. II.—The manufacture of calfskin leathers. III.—The tanning and dyeing of furs and hair skins. IV.—The manufacture of goatskin leather. V.—Some practical methods of bleaching leather. VI.—The manufacture of kangaroo leather. VII.—The manufacture of leathers from cowhides. VIII.—Processes, receipts, formulas and notes. Notes and suggestions on chrome tanning. IX.—Receipts, formulas and processes,—continued Appendix. Various patents relating to tanning, with specifications. Index.

FLEURY, P. The Preparation and Uses of White Zinc Paints. Translated from the French by Donald Grant. 179 p. 12 mo. il. 1912. $3.00

Contents: Painting on Woodwork. Better Class Painting on Woodwork. Painting on Plaster, on Mortar, and on Soft and Porous Ceilings; Hints on Painting with White Zinc; Testing Commercial Zinc Whites. The Experiments on the Dutch Commission Officially Entrusted to Make Comparative Trials between White Lead and White Zinc; Results and Criticisms of the Experiments of the Dutch Commission; Final Report of October 5, 1909; Manufacture and Different Treatments of White Zinc—Its Modifications and Improvements; The Legislative History of White Zinc Paint; Legislation. *Methods of Qualitative Analysis.* Examination of Paints; Fixed and Essential; Oils; Waxes; Formula for Encaustic and Waterproof Paints; Analysis of Paints; White Paints; White Lead and White Zinc; Blacks; Red Pigments; Carmine and Lakes; Yellow Colors; Green and Blue Pigments; Brown Colors; Binders or Liquids; Testing Preservation and Improvement of Varnishes by Aging; Analysis of Yellow and White Wax; Selected Furniture Polish Recipe. Normal Polish for Floors, Parquets and Woodwork; Virgin Wax Polish for Flatting of Paints or Polishing of Varnishes; Formula for a Waterproof Composition for Plaster and Stone and Damp Walls; Special and More Economical Formula for Waterproofing Plaster.

FLINN, ALFRED DOUGLAS, and others, compilers. Waterworks Hand Book, compiled by Alfred Douglas Flinn, Robert Spurr Weston, and Clinton Lathrop Bogert. 824 p. 8 vo. il. 1916. **$6.00**

CONTENTS: SOURCES OF WATER SUPPLY. Rainfall or precipitation. Evaporation. Run-off and stream-flow. Ground water COLLECTION OF WATER. Intakes. Watershed development by reservoirs. Masonry dams. Rockfill dams. Earth dams. Wells. Infiltration galleries. Notes on some equipment for treating water TRANSPORTATION AND DELIVERY OF WATER. Open channels. Aqueducts. Plate metal pipes. Wooden pipes. Reinforced concrete pipes DISTRIBUTION OF WATER. Cast-iron pipe and specials. Distribution systems. Valves, sluice gates, hydrants. Service meters. Pumps, pumping stations and equipment Distribution reservoirs, standpipes and tanks. Water consumption. Hydraulic computations. Masonry and puddle Non ferrous metals (also corrosion of iron and steel) Capacity and conversion tables. Miscellany. CHARACTER AND TREATMENT OF WATER Character of water Inspection of sources of supply. Storage of water and improvement of reservoirs Sedimentation Aeration and chemical treatment. Water softening Preliminary filtration and deferrization. Filtration. Examination of water.

FLINT, W. R. Chemistry for Photographers. 205 p. 12 mo 1916. **$2.00**

FOLTZER, JOSEPH. Artificial Silk and Its Manufacture. Translated from the French by T Woodhouse. 8 vo il. 256 p. 1921. **$7.50**

CONTENTS: Preface, Introductory, Cellulose; The mercerizing of vegetable fibers and fabrics, Origin of artificial silk, Chardonnet artificial silk; Despeissis artificial silk (Cuprammonium process), Solutions and apparatus for mixing, The spinning mill, The cleaning of spinnerets or capillary tubes; Washing, filtration of water, and soap washing, Drying, humidification, and ventilation, Winding, twisting, reeling and counting, waste, viscose artificial silk threads and other products, Luster artificial silk; The recovery of by-products in the Cuprammonium process, Solutions of cellulose, and the preparation of solvents, Precipitating liquids, Spinning, twisting, removal of copper, washing and drying of threads; The spinning of artificial silk on continuous machinery, Other imitations of natural silk, and the apparatus for producing them; Organization of staff and equipment for an artificial silk mill; General notes on the establishment of an artificial silk mill, Distinctive characteristics, properties and uses of natural and artificial silks, Dyeing; The conversion of cellulose into artificial hair, thread, ribbons, felt, leather, films, wall decorations and cloths for flowers, bookbinding, waterproofing and ordinary textures Index

FOLWELL, AMORY PRESCOTT. Sewerage; the designing, construction, and maintenance of sewerage systems. 540 p. 8 vo. il. 1916. **$4.00**

This rewritten edition, which has been brought strictly up to date, devotes more space than heretofore to the calculating of the sizes of sewers, especially of storm sewers, the pumping of sewage, etc

CONTENTS: PART I.—SEWERAGE SYSTEMS General outline of subject. Amount of house sewage. Amount of storm sewage. Flow in sewers. Flushing and ventilating. Sewer appurtenances Collecting the data. Designing. Detail plans Specifications and contract. Supervision of construction. Construction. Maintenance. PART II.—SEWAGE DISPOSAL. Disposal by dilution. Removing suspended matter. Oxidation methods. Other Treatment methods.

FOLWELL, A. P. Water-Supply Engineering. The designing, construction, and maintenance of water-supply systems, both city and irrigation. By A. Prescott Folwell. Editor Municipal Journal and Engineer. Third edition, rewritten. 584 p. 8 vo. il. 1917. **$4.00**

Covers every feature of the supplying of water for municipalities The present edition contains much new matter and embodies the most recent practice and discoveries

CONTENTS: Requisites of a water supply; Quantity, quality. Purification of water. Source of supply. Rainfall Surface water Rivers and lakes. Ground water. Gravity systems Pumping systems. Pumping and pumping engines. Dams and embankments. Designing. Supervision and measurement of work. Practical construction

FOOT, F. N. Baking Powder and Other Leavening Agents. 88 p. 12 mo. 1908. **$1.50**

FORT, M., and LLOYD, L. L. The Chemistry of Dyestuffs; a manual for students of chemistry and dyeing. 311 p. 8°. il. 1917. **$2.50**

A compact syllabus covering the main facts for the preparation of intermediate compounds and of dyestuffs. Has chapters on tar distillation, the application of dyestuffs, and the relation of colour to constitution. Diagrams of apparatus are given in the appendix. A thorough knowledge of pure chemistry is presupposed on the part of the reader.

FOSTER, HORATIO A. Engineering Valuation of Public Utilities and Factories. 361 p. 8 vo. 1912. **$3.00**

FOSTER, HORATIO A. Electrical Engineer's Pocketbook. A handbook of useful data for electricians and electrical engineers. With the collaboration of eminent specialists. Seventh edition, completely revised. 1636 p. 16 mo. il. 1913. **$5.00**

The book as now presented shows some corrections of typographical and other errors, together with some new material in the sections on switchboards and units, while the standardization rules of the A. I. E. E. included are the latest The aim throughout has been to supply in exhaustive and condensed form the data essential to the engineer engaged in any of the branches of the vast domain of electrical engineering.

FOULK, C. W. Quantitative Chemical Analysis. By Charles W. Foulk. Professor of Analytical Chemistry, Ohio State University. Third edition, revised and enlarged. 250 p. 8 vo. il. 1913. **$3.00**

A complete general treatise, aiming to emphasize the general aspects and points, rather than a succession of methods.

FOWLE, F. F. (Editor). Standard Handbook for Electrical Engineers. Prepared by a staff of specialists. Frank F. Fowle, Editor-in-Chief. Fourth edition, third impression, with corrections, and revision of the Standardization Rules to January, 1917. 2,000 p. 16 mo. il. 1917. Flexible binding, full gilt, thumb indexed. **$7.00**

The fourth edition of the Standard is a new book—revised, rewritten and entirely reset. It is the joint production of over 60 of the leading engineers in the field. It is a handbook written for engineers in practice. There are 25 sections with the subject matter grouped so that you can find all the material on a given subject in one section. There are 2,000 pages, but the use of special paper has kept this book down practically to the bulk of the third edition. Every subject is fully and carefully indexed for quick reference.

FOWLE, F. E. Compiler. Smithsonian Physical Tables. 355 p. 8 vo. 1914. **$2.00**

FOWLER, C. E. Law and Business of Engineering and Contracting. With numerous forms and blanks for practical use. By Charles F Fowler, C E 162 p. 8 vo. il. 1909. **$2.50**

The book is based on a sound knowledge of contract law plus a long practical experience in engineering Important chapters cover the principal kinds of insurance with forms of policies, the formation and operation of corporations, and the organization and inspection of work

CONTENTS: Chapter I—Relation between the engineer and contractor II.—Ordinary forms of contracts. III. Ordinary specifications IV.—Special forms of specifications V Special forms of contracts VI—Inspection of engineering work VII Estimating materials and the cost of engineering structures VIII. Bidding on engineering work. IX—Organization of contract work. X—Essentials of contract law.

FOWLER, GILBERT. An Introduction to Bacteriological and Enzyme Chemistry. By Gilbert J. Fowler, D.Sc, Lecturer in Bacteriological Chemistry, Victoria University in Manchester. Second impression. 336 p. 8 vo il. 1911. **$2.75**

Apart from its well known applications in the fermentation industries, Dr Fowler discusses the bearing of bacteriological and enzyme chemistry upon the questions of sanitation, especially the provision of pure water and the inoffensive disposal of sewage, and the general applications in the industries and in agriculture. The writer has had in mind, not only the sanitary officer, but also the general practitioner and the student of sanitary science.

FRANKE, G. A Handbook of Briquetting. In two volumes. Vol I—The Briquetting of Coals, Brown Coals, and Other Fuels. 631 p. 9 plates. 225 illustrations in the text. 8 vo. **$10.50**

CONTENTS: Introduction Part I The Preparation of Coal Briquettes Part II—The Preparation of Brown Coal Briquettes and Wet-Compressed Blocks Appendix. Supplement.

Vol. II.—Briquetting of Ores, Metallurgical Products, Metal Swarf and Similar Materials, Including Agglomeration. With appendices. 214 p. 4 plates. 79 illustrations in the text. 8 vo. **$4.50**

CONTENTS: Part III—Briquetting of Ores. Metallurgical products, metal swarf and similar materials, including agglomeration.

FRANKLIN, E. C. Liquid Ammonia as a Solvent. American Chemical Society Monograph. In preparation.

FRAPS, G. S. Principles of Agricultural Chemistry. By G. S. Fraps, Ph. D., Associate Professor of Agricultural Chemistry, Agricultural and Mechanical College of Texas, College Station, Texas Chemist, Texas Experiment Station; State Chemist. 501 p. 8 vo. il. 1917. **$5.00**

CONTENTS: Chapter I—Introduction II—Essentials of plant life. III.—The Plant and the atmosphere. IV—Origin of soils V.—Physical composition and classes of soils. VI.—Physical properties of soils. VII The soil and water. VIII—Chemical constituents of the soil. IX—Chemical composition of the soil X—Active plant food and water soluble constituents of the soil. XI.—Chemical changes in the soil XII—Soil deficiencies XIII—Losses and gains by the soil. XIV.—Manure XV—Sources and composition of fertilizers. XVI.—Purchase and use of fertilizers. XVII Constituents of plants. XVIII.—Composition of plants. XIX—Digestion XX Utilization of food. XXI.—The maintenance and fattening rations XXII.—Feeding work animals and growing animals. XXIII—Feeding milk cows. XXIV.—Calculation of rations.

FRARY, F. C. Laboratory Manual of Glass-Blowing. By Francis C. Frary, Ph.D., formerly Assistant Professor of Chemistry, University of Minnesota, 60 p. 12 mo. il. 1914. **$1.00**

A clear and detailed discussion of the elements of glass-blowing for workers in physical and chemical laboratories.

FRAZER, PERSIFOR and BROWN, AMOS PEASLEE. Tables for the Determination of Minerals by Physical Properties. Based on the system of the late Dr. Albin Weisbach. Sixth revised edition. 12 mo. 1910. **$2.50**

This volume was prepared as a means to assist in the diagnosing of minerals, the diagnosis, in the main, being based upon their untoward characteristics.

The minerals have been divided into three tabular systems, of which the first embraces those of metallic lustre; the second those of non-metallic lustre which give a colored powder; and lastly, the third contains all minerals of non-metallic lustre and colorless streak. These three systems of tables fall again into single tables (for example, the first into five), in which the minerals are arranged according to their hardness,—i.e. the softest are first, and the hardest last.

FRENCH, T. E. Engineering Drawing. By Thomas E. French, M.E., Professor of Engineering Drawing, the Ohio State University. 289 p. 8 vo. il. 1911. **$3.00**

This book is unusual because of its broad scope, its thoroughness and balance of treatment, and its logical and tropical arrangement

It was designed for men in every branch of engineering. It was written by a man of broad teaching and practical experience, assisted by a staff of specialists. It is a crisp, clear statement, with exceptionally fine illustrations.

FRESENIUS, C. R. Quantitative Chemical Analysis. By the late Dr. C. Remigius Fresenius, Privy Aulic Counsellor; Director of the Chemical Laboratory at Wiesbaden. Authorized and greatly amplified translation of the revised sixteenth German edition by Alfred I. Cohn, Ph.D., 2 volumes. 2035 p. 8 vo. il. 1903. **$12.50**

When sold separately: *Vol. I.*—$5.50. *Vol. II.*—$7.50.

A comprehensive treatise in which the most recent and improved methods of analysis have been incorporated. The work comprises three parts: I General, dealing with the execution of the analysis, reagents, determination and separation of bodies, organic elementary analysis II—Special, including the analysis of waters, technical and industrial products, plant ashes, soils, manures, air III—Exercises for practice. It also presents an appendix comprising analytical experiments and tables for calculating analytical results.

FRESENIUS, H. W., and MITCHELL, G. A. Introduction to Qualitative Chemical Analysis. By H. Wilhelm Fresenius. 17th Edition of the Original Work by C Remigius Fresenius. Translated by G Ainsworth Mitchell, M A. (Oxon.), F.I.C., Editor "The Analyst." 954 p. 8 vo. il. 1921. **$8.00**

This seventeenth edition of the standard work of Fresenius has been completely remodeled to make it conform with the modern conceptions of chemistry. A chapter dealing with reagents, which appeared in former editions, has been omitted as being no longer necessary, whilst the notes and additions to the systematic course have been transferred to a separate chapter At the same time the principles of the analytical systems used in the course are made clearer by the addition of tables and general surveys of each stage

Contents: Part I General Chemical Principles and Methods of Analytical Chemistry Behavior of substances to reagents; Reactions of cations, Reactions of anions Part II—Systematic Course of Qualitative Chemical Analysis Practical methods of the general course, Practical methods for special cases; Explanatory notes and additions to the practical process Appendix· Behavior of the most important alkaloids towards reagents, and systematic course for their identification, Remarks on the correct choice of exercises for practice; Tabulation of the results obtained with the substances analyzed for practice; Solubility tables

FREUND, IDA. Experimental Basis of Chemistry. 808 p. 8 vo. 1920. **$9.00**

Contents. Part I. The Proportions of Science The Subject Matter of Science, The Nature of Laws; The Discovery and Proof of Laws; The Explanation of Laws; Theories; Chance and Probability; The Meaning of Science; Science and Philosophy.

Contents: Part II. Measurement Fundamental Measurement; Physical Number; Fractional and Negative Magnitudes, Numerical Laws and Derived Magnitudes; Units and Dimensions, The Uses of Dimensions, Errors of Measurement; Metrical Errors; Errors of Consistency and Adjustment of Observations; Mathematical Physics, Appendix; Index.

FRIEND, J. NEWTON. A Textbook of Inorganic Chemistry. 8 vo.

Vol. 1. Part 1. An introduction to modern inorganic chemistry, by J. Newton Friend, H. F. V. Little, and W. E. S. Turner. Part 2. The inert gases, by H. Vincent Briscoe. 385 p. il. 1915. **$4.50**

Contents· The periodic table. General introduction to the series. Preface to Part I Preface to Part II Part I.—Introduction to modern inorganic chemistry. The fundamentals of chemical science. General properties of elements and compounds. Solubility, solution, and some properties of solutions. Molecular weight and its determination. Chemical change. Acids, bases and salts. The determination of atomic weights and equivalent or combining weights. Classification of the elements. Part II.—The inert gases. Introduction. Helium. Neon. Argon. Krypton. Xenon. Niton. Name index. Subject index.

Vol. 4. Aluminum and its congeners, including the rare earth metals, by H. F. V. Little. 486 p. il. 1917. **$5.00**

Vol. 5. Carbon and its allies, by R. M. Caven. 468 p. il. 1918. **$5.00**

Vol. 8. The halogens and their allies, by Geoffrey Martin and E. A. Dancaster. 337 p. il. 1916. **$4.00**

A treatment of the seventh group of the periodic table, comprising the halogens and manganese, together with their compounds. The most important manufacturing operations are described.

Contents: Introductory Fluorine and its compounds. Chlorine and its compounds. Bromine and its compounds. Iodine and its compounds. Manganese and its compounds Name index Subject index.

Vol. 9. Part 1 Cobalt, nickel and the elements of the platinum group. 367 p. il. 1920. **$6.00**

Vol. 9. Part 2. Iron and Its Compounds. 265 p. il. 8 vo. 1921. **$7.50**

Contents· The Early History of Iron, The Mineralogy of Iron, Preparation and Properties of Pure Iron. The Corrosion of Iron, General Properties of Iron Salts, Compounds of Iron with Hydrogen and the Halogens, Iron and the Elements of Group VI, Iron and the Elements of Group V, Iron and the Elements of Groups IV and III, Detection and Estimation of Iron.

FRIEND, J. NEWTON. An Introduction to the Chemistry of Paints. By J Newton Friend, Ph D., D Sc. Fellow of the Chemical Society, Member of the Iron and Steel Institute. 214 p. 8 vo. 1910. **$1.75**

That it is quite possible to give a thorough discussion of the chemistry of paints, without mentioning symbols, formulæ, atomic weights, etc, is proved by this volume, but for the sake of those who may wish to pursue any branch of the subject further, references are given to more advanced literature and to original papers.

FRIEND, J. NEWTON. The Chemistry of Linseed Oil. 93 p. 12 mo. 1917. **$1.00**

Contents· Introduction; The manufacture of linseed oil; The chief constituents of linseed oil; Properties and reactions of linseed oil; The chemistry of linseed oil and linoxyn; Polymerised and oxidized oils; Bibliography and notes.

FRIEND, J. NEWTON. The Corrosion of Iron and Steel. 314 p. 12 mo. 1911. **$2.50**

The object of the present work is to present a concise account of all the important work that has been done in connection with the corrosion of iron, and to enable the expert, by means of the numerous references, to come into direct contact with all the important original contributions to the subject, and to learn along what lines further research is necessary.

FRITSCH, J. The Manufacture of Chemical Manures. Translated from the French, with numerous notes by H. B. Stocks. Second edition, revised and enlarged. 395 p. 8 vo. il. 1920. **$6.00**

Contents: Phosphoric Acid. Principal Phosphate Deposits. Drying and Enrichment of Phosphates. Historical Review of Superphosphate Manufacture Theory of Manufacture of Soluble Phosphate Superphosphate Manufacture. Crushing, Sifting, Drying, and Storing of Superphosphate Retrogradation Compound Manures. Manufacture of Phosphoric Acid Double Superphosphates and Various Products. Manufacture of Bone Dust and of Bone Superphosphate (Vitriolized Bones). Manufacture of Basic Slag. Nitrogenous Manures. Manufacture of Manure from Animal Waste Recovery of Nitrogen from Distillery Spent Wash. Manufacture of Cyanamide and of Nitrate of Lime Nitrogenized Phosphatic Manures Potassic Manures. Transference and Handling of Raw Materials and Finished Products

FRYER, P. J., and WESTON, F. E. Technical Handbook of Oils, Fats and Waxes. v. 1. 8 vo. 1917. **$2.75**

A concise handbook "designed to meet the needs of the technical worker and the works chemist."—*Preface* Gives physical and chemical composition.

FULLER, G. W. Sewage Disposal. By George W. Fuller, Consulting Engineer and Sanitary Expert; Mem. Am. Soc. C.E., etc. 767 p 8 vo. il. 1912. **$7.00**

A comprehensive work full of concrete facts, with a comparison of values and data on methods. It is the product of the author's twenty five years' association with this branch of sanitary work. It became at once the leading American book on sewage disposal.

FULLER, HENRY C. Chemistry and Analysis of Drugs and Medicines. By Henry C. Fuller, B S, in charge Division of Drug and Food Products, Institute of Industrial Research, Washington, D. C. 1072 p. 8 vo. il. 1921. **$10.00**

Contents: Part I—General Methods and Crude Drug Assays. Part II—Alkaloidal Drugs, Alkaloids and Medicinally Allied Substances Definition and general methods of separation and identification; Alkaloids derived from pyridin, from pyrrolidin, from quinolin, from isoquinolin; Alkaloids which probably contain a pyridin nucleus; Alkaloids with no pyridin nucleus and those of unknown composition. Part III—Glucosides, Glucosidal Drugs and Natural Drugs Containing Principles Other Than Alkaloids. Glucosides; Purgatus drugs; Miscellaneous actur drugs; Botanical drugs; Gums and resins. Part IV—Organic Substances Other Than Alkaloids or Glucosides. Hydrocarbons; Alcohols; Ethers; Aldehydes and ketones; Organic acids, Ethereal salts and phinenols; Synthetic organic nitrogen compounds; Anilides and phenetidines, Organic arsenicals; Proteins and digestives, Oils. Part V—Inorganic Section. Methods of identification; Non-Metals and their compounds; Metals and their compounds.

FULLER, HENRY C. The Qualitative Analysis of Medicinal Preparations. By H. C. Fuller, B.S. Second edition. 191 p. 8 vo. 1921. **$2.25**

Gives many practical and reliable schemes for separating and identifying substances in medicinal products.

Contents: First Portion: Scheme of analysis; Separation of substances into groups, Tables of reactions of anesthetics and opium alkaloids. Second Portion: Analysis of extracts, tinctures, elixirs, emulsions, tooth washes, gargles, pills, powders, effervescent preparations, pastes, ointments, plasters, digestives, etc.

FULTON, C. H. Principles of Metallurgy. 544 p. 8 vo. 1910. **$6.00**

Contents· The metals and metallurgy from the historic point of view. Physical mixtures and thermal analysis Physical properties of metals Alloys The physical properties of alloys The measurement of high temperature. Typical metallurgical operations Slags Matte, bullion and speise, refractory material for furnaces. Fuels. Combustion. The production and heating of blast furnaces. An example illustrating the physics and chemistry of a smelting operation; The blast furnace for copper.

GAGE, SIMON H. The Microscope. 472 p. 8 vo. 1917. **$3.00**

A guide for every one who uses the microscope This new edition discusses the perfected forms of darkground illumination.

GAMBLE, WILLIAM. Photography. (Pitman's Common Commodities and Industries.) 132 p. 12 mo. il. 1920. **$1.00**

Contents: The discovery of photography; The camera and lens; Dark-room and its equipment; The sensitive plates; Wet collodion process; The sensitive plates; Collodion emulsion and dry plates; Making the exposure; Development and after-treatment of the plate; Printing processes; Printing processes, Carbon and other methods; Enlarging, copying, and lantern slide making; Color processes; Scientific application of photography; Cinema photography; Photo-mechanical processes; Industrial application of photography; Photography in warfare.

GARCIA, A. J. R. V. Dictionary of Railway Terms in Spanish-English and English-Spanish. 350 p. 8 vo. 1912. **$3.00**

A Spanish-English and English-Spanish dictionary containing not only the principal terms, but all the rare words as well as those of recent origin that concern railway enterprise, the details of the laying of the line, the rolling stock from its trucks and wagons to its luxurious dining cars, and the stations with their hotels, garages and dependencies. Special terms that in Cuba, Mexico, and South America differ from those used in Spain are also included.

GARDNER, HENRY A. Paint Researches and Their Practical Applications. 363 p. 8 vo. il. 1917. **$5.00**

Contents: Growth of the prepared paint industry and its relation to the work of the painter; White pigment industry; Physical characteristics of pigments and paints; Tests of lithopone; Washington paint oil tests; Paint protection for Portland-cement surfaces; paints to prevent electrolysis in concrete structures; Paints for metal; marine paints; Arlington paint tests; Observations on painted lumber; Impregnated panel tests; Fire retardant paints for shingles and other wooden structures; Composition of paint vapors; Toxic and antiseptic properties of paints; Light-reflecting values of white and colored paints; Formation and inhibition of mildew in paints; Fungi on painted sur-

faces; Changes occurring in oils and paste paints, due to autohydrolysis of the glycerides; Effect of pigments upon the constants of linseed oil; Storage changes in vegetable and animal oils; Paint dryers and their application; Miscellaneous oil investigations; Application of paints and finishes to wood.

GARDNER, HENRY A. Papers on Paint and Varnish, and the Materials Used in Their Manufacture. 501 p. 8 vo. il. 1920. $10.00

CONTENTS: Résumé of soya bean oil investigation; Driers for soya bean oil; Marine animal and blubber oils; Miscellaneous fish oils; Changes in oils upon storage, New foreign oils, Standards for tung oil, Hexabromide test for determining purity of linseed oil, A method for determining the acid values of varnishes and boiled oils, Effect of moisture on the drying of oils and varnishes, Fume loss in boiling oils; Fume control in the varnish industry, Tests of moisture and water resistance of various coatings on small boat construction, New exposure tests at Atlantic City; Production of rosin tung esters (Tunga resin), Bulking values and yields of pigments and liquids used in paint and enamel manufacture; Oil absorption of pigments, Fineness and texture of pigments; Metal powders as pigments, Primers for aluminum and galvanized iron; Rare elements as paint pigments, Waterproof glues, Quick drying lacquer coatings; Notes on the standardization of mineral spirits; An emollient for skin protection in the dope- and varnish using industries; Illumination from paint; Dark wall colors for operating rooms, Notes on the effect of colored light upon plant growth and pigmentation; Metric equivalents; Spreading rates of prepared paint products, A study of the practicability of spray painting, Preservative function of paint and varnish; Paints for the home, Paint and varnish in the great war, Standard paint specifications of the War Department; Interdepartmental specifications.

GARDNER, WALTER M. The British Coal-tar Industry. Its origin, development, and decline. 437 p. 8 vo. il. 1915. $3.75

The coal-tar industry is of tremendous importance to the industrial independence of the United States. This volume presenting papers and studies published through the present half century will be of great value in instructing us how England failed to hold her supremacy and the means by which Germany gained her position It is a book not only for the chemist but for the student of industrial activities, the economist, the leader of industry and the general reader

CONTENTS Introduction. 1868 The aniline or coal tar colors 1870. The artificial production of alizarin. 1879 The history of alizarin and allied coloring matters. 1880 The newer artificial coloring matters derived from benzene. 1881. Indigo and its artificial production. 1885. The coloring matters produced from coal tar 1886. The scientific development of the coal tar color industry 1896 The origin of the coal tar color industry and the contribution of Hoffmann and his pupils. 1901. The synthesis of indigo 1901 The relative progress of the coal tar industry in England and Germany during the past fifteen years. 1901. The indigo crisis. 1902 Applied chemistry, English and foreign. 1903. The relation between scientific research and chemical industry. 1905. History of the coal tar color industry between 1870 and 1885. 1906. Note on the Perkin jubilee. 1908. The founding of the coal-tar color industry 1908 Letters from Prof. H Caro to Prof. R. Meldola, May, 1908. 1910 Tinctorial chemistry, ancient and modern. 1910. Patent law in relation to the dyeing industry. 1910. The coal-tar color industry of England, causes of its progress and retardation. 1914. The artificial color industry and its position in the country 1914 The supply of chemicals to Britain and her dependencies. 1914. Britain and Germany in relation to the chemical trade. 1914. The manufacture of aniline dyes in England. 1915. German chemical industry thirty years ago. 1915. The manufacture of dyestuffs in Britain 1915. The chemical industries of Germany. 1915. Patent law reform. 1915 The supply of dyewares. 1915. The position of the organic chemical industry Index of names. Index of coloring matters. Tabular and statistical information.

GARDNER, H. A., and SCHAEFFER, J. A. The Analysis of Paints and Painting Materials. By Henry A. Gardner, formerly Director, Scientific Section, Educational Bureau, Paint Manufacturers' Association of the United States, and John A. Schaeffer. 96 p. 8 vo. il. 1910. $2.00

The authors present several important methods of analysis selected from the laboratories of American manufacturers, and include and correlate with them many new and valuable methods

CONTENTS: I—The analysis of dry pigments II—The analysis of mixed pigments and paints. III.—The analysis of paint vehicles and varnishes. Appendix A.—Analysis of bituminous paints. Appendix B.—Paint specifications.

GARLAND, C. M., and KRATZ, A. P. Tests of Suction Gas Producer. Bulletin 50, Engineering Experiment Station, University of Illinois. 91 p. 8 vo. 1912. $0.50

GATEHOUSE, FRANK B, A Handbook for Cement Works Chemists. 164 p. 8 vo. il. 1917. $2.50

New edition shows considerable revision Additional chapters on the analysis and examination of aggregates, and on cement testing, while the tables of atomic weights have been changed in accordance with the International Table of 1916. An up-to-date laboratory manual covering the essential manipulations. Chapters on analysis of fuel, lubricants, water, and kiln gases.

CONTENTS: Introduction. Analysis of raw materials. Calculation of proportion of raw materials Analysis of fuel, lubricants, water, and kiln gases. Cement analysis. Appendix Indices.

GATTERMANN, L. The Practical Methods of Organic Chemistry. By Ludwig Gattermann, Ph.D. The third American, translated from the eleventh German, edition by William B. Schober, Ph.D., Professor of Chemistry in Lehigh University and Vahan S. Babasinian, Ph.D., Associate Professor of Organic Chemistry in Lehigh University. Third edition. 401 p. 12 mo. 1917. $2.25

The work has been thoroughly revised and contains the following important new features:

1. A detailed description of Dennstedt's method of analysis for carbon, hydrogen, nitrogen, sulphur and halogens.

2. Typical examples, with full discussions, illustrating Grignard's reaction.

3. Discussions of the theory of extraction with ether, theory of salting out, and theory of reversible reactions.

As the latest methods are included and the results of the most recent researches are incorporated in the new edition, this book will continue to prove indispensable as a laboratory guide and reference book for all students of organic chemistry.

GEERLIGS, H. C. PRINSEN. Cane Sugar and Its Manufacture. 390 p. 8 vo. Reprinting.

CONTENTS: The raw material. Constituents of the sugar cane; Proportion and distribution of the constituents of sugar cane. Sugar manufacture Extraction of the juice, Clarification, Methods of clarification, Lime and lime cream; Filtration; Concentration of the juice; Curing; Exhausted molasses.

The author was for a time director of the West Java Sugar Experiment Station. The aim of the author has been to compile in one book all that is known about the chemistry and technology of the sugar cane and cane sugar manufacture.

GEERLIGS, H. C. PRINSEN. Chemical Control in Cane Sugar Factories. 152 p. 8 vo. 1917. $5.00

CONTENTS: Analytical methods. Cane; bagasse; mill juices; raw juice; clarified juice, Sweet waters from the filter presses Filter-press cake; syrup, massecuites, green molasses; final molasses, first and second sugars, molasses sugar; recapitulation of the necessary analyses Determination of quantities Weights directly ascertained; weights that are calculated Stocktaking Calculated percentages. Various calculations. Final account of sucrose extracted and lost; native assistance Factory and laboratory instruments Verification of weighbridges, measuring tanks and instruments; instruments and utensils required, tables; models of books

A revised and enlarged edition of this well known work, presenting the most modern methods that are in use for the sampling and analyzing of the several products and the calculating and recording of the results in cane sugar factories in almost every cane sugar country in the world This book should be in the library of every sugar chemist.

GEERLIGS, H. C. P. Practical White Sugar Manufacture; or the manufacture of plantation white sugar directly from the sugar cane. 196 p. 8 vo. 1915. $5.00

An exhaustive treatise dealing not only with the technical details of white sugar manufacture, but the practical facts as to the comparative costs of the various competing processes.

GEERLIGS, H. C. P. The World's Cane Sugar Industry, Past and Present. 420 p. 8 vo. il. 1912. $5.00

CONTENTS: General history of the cane sugar industry; General survey of the history of the cane sugar industry from the beginning down to the present day, Condition of the cane sugar industry in the different countries of production; In British India, Straits settlements; Cochin China; China; Japan; The Philippines; Java; Spain; United States of America; Mexico; Cuba; Santo Domingo; Porto Rico; British West Indian Islands; French Antilles; St Croix; Central America; South America; Africa; Commonwealth of Australia; Hawaiian Islands; Fiji Islands, Tahiti, Text of the Brussels sugar convention; Appendix.

GEORGEVICS, G. von. Chemical Technology of Textile Fibers. 320 p. 8 vo. 1914. $7.00

GETMAN, FREDERICK H. Laboratory Exercises in Physical Chemistry. By Professor Frederick H. Getman, Ph.D. Second edition, revised. 285 p. 115 il. 8 vo. 1908. $2.00

The book is a laboratory manual simplifying the study of physical chemistry for the student It covers the subjects of thermal, optical, electrical and dynamical measurements

GETMAN, FREDERICK H. Outlines of Theoretical Chemistry. Second edition, thoroughly revised and enlarged. 552 p. 8 vo. il. 1918. $3.50

CONTENTS: Fundamental principles; Classification of the elements; The electron theory, Radioactivity; Atomic structure; Gases; Liquids; Solids; Solutions, Dilute solutions and osmotic pressure; Association, dissociation and solvation; Colloids; Molecular reality; Thermochemistry; Homogeneous equilibrium; Heterogeneous equilibrium; Chemical kinetics; Electrical conductance; Electrolytic equilibrium and hydrolysis; Electromotive force; Electrolysis and polarization; Photochemistry.

GETTY, VINCENT C. How to Read a Drawing. 64 p. 8 vo. il. 1912. $1.25

The understanding of a drawing has appeared to many who are not familiar with this branch of education to be a very difficult study. It has been the writer's province to know that there are a vast number of mechanics who look upon drawings with awe, thinking that to become proficient in the understanding of drawings they first must have scholarly or technical knowledge It is the purpose of this book to show that this is a very erroneous idea, it being a fact that this branch of education requires less study than almost any other branch of useful knowledge; and all the education necessary is that the student be able to read and understand the English language

CONTENTS: Method of representing objects. Lines used in projection drawing. Views needed. Universally used structural shapes. Scales used in drawing Bolts, nuts, rivets, etc Structural details. Mechanical drawings Gearing. Finishing. Storage tank and valve. Architectural drawing.

GIBBS, W. M. Spices and How to Know Them. Illustrated. Colored plates. 179 p. 8 vo. 1909. net, $3.50

CONTENTS: Introduction; Early history of spices; Adulteration of spices; How to detect adulteration in spices; Their formation and analysis; Black pepper; White pepper; Long pepper; Capsicum, or Cayenne; Pimento, or allspice, Cinnamon and cassia; Cloves; Ginger; Nutmegs; Mace; Mustard; Herbs

GILDEMEISTER, E., and HOFFMANN, F. The Volatile Oils. By E. Gildemeister and Fr. Hoffmann. Second edition by E. Gildemeister Authorized translation by Edward Kremers 2 vols. 8 vo. il. 1920. each $10.00

CONTENTS: Vol. I.—Historical introduction. Production of flower perfumes by extraction. Enfleurage and maceration. Principal constituents of volatile oils. Natural and artificial perfumes. The examination of volatile oils. Vol II—Description of 416 volatile oils, beginning with the family of the Chroolelidaceae, up to and inclusive of, part of the Rutaceae.

GILL, A. H. Engine Room Chemistry. 212 p. 12 mo. 1913. $1.50

Contents Preface. Introduction. Apparatus and chemicals. Fuels and their analysis. The regulation of combustion Gas analysis Examination of certain oils Petroleum products Vegetable oils. Animal and vegetable oils. Appendix. Index

GILL, A. H. Gas and Fuel Analysis for Engineers. 145 p. 12 mo. 1917. $1.50

Chapters. Sampling Suction apparatus. Gas holders. Apparatus for the analysis of chimney gases The measurement of temperature Calculations Apparatus for the analysis of fuel and illuminating gases Preparation of reagents and arrangements of the laboratory Fuels Solids, liquid and gaseous, their derivation and composition Analysis and determination of heating value Tables and specifications

GILL, A. H. A Short Hand-Book of Oil Analysis. Eighth edition, revised and enlarged. 188 p 12 mo il 1918 $2.50

Contents Part I Physical and chemical tests Petroleum products Chemical tests. Animal and vegetable oils General considerations regarding lubricants Part II Derivation, description, and examination of certain oils Petroleum products Vegetable oils. Animal oils. Waste fats Appendix Index

GILLETTE, H. P., and DANA, R. T. Handbook of Mechanical and Electrical Cost Data By H P Gillette, Editor, Engineering and Contracting, and R. T. Dana, Mem. Am. Soc. C E , Am. Soc. Eng. Cont , A I M E. 1500 p 12 mo. 1918 $6.00

A complete cost data book for engineers The net prices, shipping weights, etc , of machines and appliances of many types, classes and sizes are given, together with costs of installation and operation The costs are in such detail, with a résumé of governing conditions, that they are invaluable aids in making estimates and indispensable as a guide for the economical operation of existing plants Rates of wages and prices of materials are stated so that a proper substitution may be made for times and communities where different conditions prevail

Contents I General economic principles II Depreciation, repairs and renewals III Buildings. IV Chimneys. V—Moving and installing VI Fuel and coal handling VII Steam power. VIII—Internal combustion engines and gas producers IX—Hydro-electric plants X Complete electric light and power plants. XI—Overhead electric transmission XII Underground electric transmission. XIII Lighting and wiring XIV Belts, shafts, pulleys pipe and miscellaneous power transmission XV—Compressed air XVI—Gas plants. XVII Pumps and pumping XVIII—Conveyors and hoists. XIX—Heating, ventilating and refrigeration XX—Electric railways. XXI Miscellaneous.

GIOLITTI, FREDERICO. Heat Treatment of Soft and Medium Steels. Translated by F E. Thum and D. G. Vernaci 374 p. 8 vo. 214 il. 1921. $5.00

The first systematic discussion of the effect of various impurities and addition agents on commercial heat treatment Dr Giolitti proves in this book the tremendous advantages to be gained by the elimination or suppression of these impurities and addition agents If for nothing else, Dr. Giolitti's book is of great importance for its insistence that commercial heat treatment of steel depends primarily upon the diffusion of carbon and other soluble substances contained, gaseous or solid

Contents Part I—The Phenomena of Diffusion in Primary Solid Solution II—Effects of Diffusion upon Secondary Crystallization III—Diffusion in Austenite as Applied to the Preliminary Heat Treatment of Steels IV Preliminary Heat Treatment of Steel Castings V—Preliminary Heat Treatment of Forged and Rolled Steels

GISSING, FREDERICK L. Commercial Peat: its use and its possibilities 191 p. 8 vo. il 1910. $2.50

GIUA, M., and GIUA-LOLLINI, C. Chemical Combination Among Metals. Translated by Gilbert W Robinson 355 p. 8 vo. il. 1918. $4.50

Contents: Equilibrium diagrams. Thermal analysis. The nature of intermetallic compounds; Physical properties, Homopolar intermetallic compounds, Heteropolar intermetallic compounds, Ternary intermetallic compounds, Tables.

GIVEN, A. Methods for Sugar Analysis and Allied Determinations. 75 p. 8 vo. il 1912 $2.00

A concise and valuable book for laboratory use of food, drug and dairy chemists and for manufacturers and chemists in lines of food and other sugar containing products By Arthur Given, B S , formerly Assistant Chemist, Sugar Laboratory Bureau of Chemistry, U S Dept of Agriculture; Formerly Assistant Chemist New Hampshire Agricultural Experiment Station, Chemist for the Cuban Sugar Refining Co, etc.

GLAISTER, JOHN, and LOGAN, D. D. Gas Poisoning in Mining and Other Industries. 471 p. 8 vo. 1914. $3.50

Contains 12 p of bibliography.

GOLDINGHAM, A. H. Design and Construction of Oil Engines. Fourth edition, enlarged. 260 p. 12 mo. il. 1914 $2.50

Contents of Chapters: 1.—Introductory. 2—On designing oil engines. 3—Testing oil engines. 4—Cooling water tanks and other details 5—Oil engines driving dynamos. 6—Oil engines connected to air-compressors, water-pumps, ice and refrigerating machines. 7—Instructions for running oil engines. 8—Repairs. 9—Oil engine troubles. 10—Various engines described. 11—Portable oil engines. 12—Large aired oil engines. 13—Fuels, analyses and tables 14—Miscellaneous, tables, fire insurance, etc. 15—Marine Diesel engines. 16—Various types of marine Diesel engines. 17—Large stationary Diesel engines. Index.

GOLDINGHAM, A. H. Marine and Stationary Diesel Engines; described and illustrated, with numerous formulæ for the design and directions for their installation and operation. 206 p. 12 mo. il. $3.00

Contents: Introductory. Details of construction. Indicator cards. Marine Diesel engine discussed. Operation and correction. Various types of marine Diesel engines. Stationary Diesel engines. Index. Tables.

GOODCHILD, W. Precious Stones. With a chapter on Artificial Stones by R. Dykes. 319 p. 8 vo. il. 1908. $2.50

Contents: Introduction; Modes of Origin; Physical Properties of Gem Stones, Cutting of Gems, Limitation Gems and the Artificial Production of Precious Stones; Diamond, Fluorspar; Opal; Corundum; Spinel and Chrysoberyl; Calcite, Labradorite; Beryl, Garnet; Olivine, Sphene, Apatite, Jet, Glossary.

GOODELL, F. R. Tire Making and Merchandising, with chapters on rubber. Second edition. 12 mo. il. 1921. $3.00

GOODENOUGH, G. A. Properties of Saturated and Superheated Ammonia Vapor. Bulletin 66, Engineering Experiment Station, University of Illinois. 94 p. 8 vo. 1913. $0.50

GOODENOUGH, G. A. Properties of Steam and Ammonia. By G. A. Goodenough, M E , Professor of Thermodynamics, University of Illinois. Second edition. 126 p. 8 vo il 1917. $1.60

A new set of tables based on the latest and most accurate experimental data The tables of superheated and saturated steam are based on a new formulation, are consistent and exceedingly accurate.

Contents: General theory of the thermal properties of steam and of ammonia Explanation of the tables and diagrams Illustrative examples Tables: Properties of saturated steam Properties of superheated steam Boiling points. Properties of water Mixtures of air and water vapor Properties of saturated ammonia Properties of superheated ammonia Logarithms. Conversion tables. Mollier chart for steam. Mollier chart for ammonia.

GOODENOUGH, G. A. Thermal Properties of Steam. Bulletin 75, Engineering Experiment Station, University of Illinois. 69 p. 8 vo. 1914. $0.25

GOODRICH, W. FRANCIS. Modern Destructor Practice. 278 p. 8 vo. il. 1912. $4.75

An experience of nearly twenty years in combustion engineering and an intricate knowledge of the many problems which have had to be faced in the evolution of the Modern Refuse Destructor during the past eighteen years, makes it possible for the author to express some very definite opinions and to discuss much which is of a controversial nature

Contents: Some alternative methods of refuse disposal Representative types of British destructors Systems of charging destructors. Destructors combined with sewage works Destructors combined with electricity works Refuse destructors in the United Kingdom. The destructor site Destructor specifications Destructor design and operation The air supply for combustion—The steam boiler—The chimney, bye-pass flues, and dust retention—Operation costs Labour and maintenance, clinkering The Utilization of residuals. Foreign and colonial practice United States and Canadian practice Index.

GORE, G. The Art of Electrolytic Separation of Metals. 317 p. 8 vo. il. 1890. $4.50

Contents: Chief Electrical Facts and Principles, Thermal Phenomena of the Electrolytic Separation of Metals, Chemical Facts and Principles; Chemico-electric or Voltaic Action; Electrochemical Action; Generation of Electric Current by Dynamo Electric Machines; Establishing and Working an Electrolytic Copper Refinery; Other Applications of Eletcrolysis in Separating and Refining Metals

GOULD, GEORGE M. Practitioner's Medical Dictionary. Third edition. Entirely reset from new type Revised and enlarged by R. J E. Scott. 962 p. 8 vo. 1916.

Flexible cloth with thumb index	$4.50
Flexible fabricoid with thumb index	$6.25

"Great pains have been taken to include most of the new terms that have been coined in such profusion during the last decade or so, and the metric system equivalent has been added where weights and measures are given, especially in the matter of doses The additions and changes of the new pharmacopeia (U. S.) have been included, also the B N A. Anatomical nomenclature"

GOULDING, ERNEST. Cotton and Other Vegetable Fibres; their production and utilization, with a preface by Wyndham R. Dunstan. 230 p. 8 vo. il 1917. $3.00

The Imperial Institute has for many years investigated the possibilities of fibre production in all of those British countries which seem to present chances of success. Much of this work has been experimental The present volume gives information concerning the world's production of cotton, flax, hemp, ramie, jute, cordage, and miscellaneous fibres, with information on cultivation, preparation, commercial value, etc.

GOWLAND, WILLIAM. The Metallurgy of Non-Ferrous Metals. 496 p. 8 vo. il. 1918. $8.50

One of a series of treatises written by associates of the Royal School of Mines.

This modern treatment, of infinite value to metallurgical students and practical workers in the field of non-ferrous words, clearly defines the principles on which the various processes which cover the modern work in non-ferrous metals are carried on. To be up to date in the profession you should have knowledge of the latest ideas elucidated in this volume.

Contents: Refractory materials. Roasting. Fluxes and slags. Copper. Lead. Gold. Silver. Platinum. Mercury. Zinc. Cadmium. Tin. Nickel. Cobalt. Antimony. Arsenic. Bismuth. Aluminum. Index.

GRADWOHL, R. B. H., and BLAIVAS, A. J. The Newer Methods of Blood and Urine Chemistry. Second edition, revised and enlarged. 418 p. il. 1917. $5.00

GRANJON, R., and ROSEMBERG, P. A Practical Manual of Autogenous Welding (Oxy-Acetylene); with a chapter on the cutting of metals with the blowpipe. Seventh edition. 260 p. 12 mo. il. 1918. $2.80

Contents: The different methods of making permanent metallic joints. Autogenous welding with blowpipes. Is autogenous welding of easy application? In what cases should it be employed? Oxygen. Acetylene. Oxy-acetylene blowpipes. Welding installations. Working of welding installations. Properties of metals. Metals and materials added. Autogenous welding of steel, cast iron, copper, brasses and bronzes. Aluminum. Various metals and alloys. Welding machines. Cutting of iron and steel. Index.

GRANT, J. The Chemistry of Breadmaking. 234 p. 12 mo. il. 1917. **$2.00**

In this volume, the learner is supplied with a handbook describing simply and clearly the chief points where breadmaking is brought into contact with chemical, physical and bacteriological science. A large number of analyses are included which are original and not hitherto published.

GRAY, A. Principles and Practice of Electrical Engineering. By Alexander Gray, Whit. Sch, M Sc, Professor and Head of the Department of Electrical Engineering, Cornell University Author of "Electrical Machine Design" Second edition, revised and enlarged. 431 p. 8 vo il 1917. **$4.00**

A revision of the standard textbook for those who desire to obtain a broad idea of the principles and practice of electrical engineering without studying the subject in detail The fundamental principles are emphasized and elaborated gradually to show applications.

GREEN, ARTHUR G. The Analysis of Dyestuffs, and Their Identification in Dyed and Colored Materials, Lake-Pigments, Foodstuffs, etc. 144 p 8 vo il 1915 **$3.75**

This book is for those who are concerned with the manufacture or application of dyestuffs. In America the subject is one of tremendous importance The great progress in the development of the artificial dyestuff industry has brought with it a necessity for systematic methods of analysis capable of being applied not only to dyestuffs in substance, but also to all manner of dyed and colored materials

CONTENTS: Introduction to dyestuff chemistry Classification of dyestuffs. Analysis of coloring matters in substance Identification of dyestuffs on animal fibers Identification of dyestuffs on vegetable fibers Analysis of indigo in substance and upon the fiber Analysis of pigments and lakes. Determination of the constitution of azo dyestuffs

GREENAWALT, W. E. The Hydrometallurgy of Copper. By William E. Greenawalt, C E, B S 504 p 8 vo il 1912. **$6.00**

Part I—Roasting Part II—Hydrometallurgical processes

Wet methods of treating copper ores are diverse. Information has been fragmentary and widely scattered Mr Greenawalt, with the assistance of prominent specialists, made an exhaustive study of the literature. He has, besides, been active in the development of various processes, and gives freely here the results of his research The book covers processes, methods, apparatus, and compares the various processes

GREENE, A. M. The Elements of Refrigeration. A text book for students, engineers, and warehousemen By Professor Arthur M. Greene, Jr. 472 p. 8 vo il 1916 **$4.50**

The book brings together in logical order the data from which to design, construct, and operate refrigeration apparatus

CONTENTS Physical phenomena and introduction Methods of refrigeration. Thermodynamics of refrigerating apparatus Types of machines and apparatus Heat transfer, insulation, and amount of heat Cold storage Ice making Other applications of refrigeration Cost of installation and operating costs. Problems

GREENE, A. M. Pumping Machinery. A treatise on the history, design, construction and operation of various forms of pumps. By Professor Arthur M Greene, Jr Second edition 703 p. 8 vo. il. 1919. **$4.50**

Comprises an examination and description of the various forms of pumping machinery, together with a treatise on methods of design

CONTENTS Modern forms of pumps Simplex pumps Dynamics of water end Design of parts Dynamics of steam end Steam end details. Test of pumping engines High duty pumps and water works stations. Special pumping machinery Injector and pulsometer Airlift pumps and pneumatic pumps Centrifugal pumps Mine pumps

GREENE, WILLIAM H. Lessons in Chemistry. Fourth edition thoroughly revised, by Harry F Keller, Ph D. 360 p 12 mo il 1908. **$1.00**

GREENFIELD, ERIC VIELE. Introduction to Chemical German. 384 p 12 mo 1918. **$1.40**

GREGORIUS, R. Mineral Waxes, Their Preparation and Uses. Translated by C. Salter. 247 p. 12 mo. il. 1908 **$3.00**

CONTENTS: Ozokerite and ceresine, Paraffin, Mineral (Montan) wax; Various appliances for extracting, distilling, and refining ozokerite, etc; Uses of ceresine, paraffin and mineral wax.

GRIFFIN, ROGER CASTLE. Technical Methods of Analysis. As Employed in the Laboratories of Arthur D Little, Inc Edited by the author, who is Director of Analytical Department, Arthur D. Little, Inc. 666 p 8 vo. 29 il. 1921. **$6.00**

CONTENTS: Reagents; General inorganic analyses, General organic analyses; Analysis of metals; Analysis of fuels; Analysis of paints and paint materials; Analysis of oils, fats, waxes and soaps, Analysis of wood, paper, and paper-making chemicals, Analysis of textiles and textile fibers; Analysis of foodstuffs; Miscellaneous analyses

GRIFFITHS, D. Methods of Measuring Temperature; with an introduction by E. H. Griffiths. 176 p. 8 vo. 1918. **$2.75**

GROSS, E. Hops, in Their Botanical, Agricultural and Technical Aspect, and as an Article of Commerce. Translated from the German by Charles Salter. With tables and diagrams. 353 p. 8 vo. il. **$5.00**

CONTENTS: History; The Hop Plant Cultivation; Preservation and Storage; Physical and Chemical Structure of the Hop Cone; Judging Value of Hops; Statistics of Production; The Hop Trade.

GROSSMAN, J. Ammonia and Its Compounds. 151 p. 12 mo. 1913. **$1.50**

CONTENTS. Ammonia; Concentrated Gas-Liquor; Liquor Ammoniae; Liquid Ammonia; The Carbonates, Sulphate, Chloride, Nitrate, Phosphate, Sulphides, Fluorides, Sulphocyanide, and Ferrocyanide of Ammonia; Waste Gases and Liquors from the Manufacture of the Sulphate; Ammonia Recovery from Spent Oxide; Tables.

GROSSMAN, J. The Elements of Chemical Engineering. Second edition, revised, with a preface by Sir William Ramsay, K.C.B., F.R.S. 152 p. 12 mo. il. **$2.00**

CONTENTS: Introduction. The beaker and its technical equivalents. Distilling flasks. Liebig condensers, fractionating tubes, and their technical equivalents. The air bath and its technical equivalents. The blowpipe and the crucible, and their technical equivalents. The steam boiler and other sources of power General remarks on the application of heat in chemical engineering The funnel and its technical equivalents The mortar and its technical equivalents Measuring instruments and their technical equivalents. Materials used in chemical engineering, and their mode of application Technical research and the designing of plant Conclusion Current prices of chemicals and materials Index.

GROTH, P. The Optical Properties of Crystals. Translated from the Fourth Revised and Augmented German Edition by B H. Jackson 309 p 8 vo. 121 il 2 colored plates 1910. **$3.50**

Sets forth the principles governing the effect of the structure of crystals on the propagation, reflection, refraction and polarization of light

GROVES, C. E., and THORP, W. Chemical Technology. The Application of Chemistry to the Arts and Manufactures Edited by Charles E Groves, F R S, and Wm. Thorp, B.Sc, F I C Each volume sold separately

Volume I Fuel and Its Applications By E. J Mills, F.R.S, and F J Rowan, C E 8 vo il 1889 **$6.00**

Volume II Lighting, Candles, Oils, Lamps, Etc By W Y Dent, L. Field, Boverton Redwood, and D. A. Louis. 8 vo. il **$5.00**

Volume III Gas Lighting By Charles Hunt, Manager of the Birmingham Gasworks 8 vo il **$4.50**

Volume IV Electric Lighting and Photometry. By Arthur G Cooke, M A, head of the Electric Engineering Department at the Battersea Polytechnic, and W. J Dibdin, F C.S. 8 vo il **$4.50**

GRUNWALD, JULIUS. The Raw Materials for the Enamel Industry and Their Chemical Technology. A treatise for manufacturers, chemists, and enamel technologists, translated by Herbert H Hodgson, M A, B Sc, Ph D 225 p. 8 vo. il. 1914 **$3.50**

Enamelling is an industry rapidly developing in the United States. For an exact knowledge of a works' procedure an acquaintance with the chemical mineralogical technology of the raw materials is essential. The author has given us the latest practice and research in as compressed and popular manner as possible

CONTENTS Feldspar Quartz, Fluospar or fluorite Clay (alumino silicates) Borax and boric acid. Chemical technology of cryolite, and its substitutes, such as sodium silicofluoride, also the function of cryolite in enamel manufacture Pyrolusite Chemical technology of tin oxide. Other white colouring agents Nickel oxide. Cobalt oxide and cobalt compounds Soda or sodium carbonate Saltpetre Potash Some important enamelling pigments General enamel recipes Index.

GRUNWALD, JULIUS. The Technology of Iron Enamelling and Tinning. 136 p 8 vo 1915. **$3.00**

The chapters contained in this book are the outcome of studies originating in the very restricted leisure time possessed by the director of a large works

CONTENTS A contribution to the history of the enamels and of their technology The economic significance of the sheet iron enamelling industry A contribution to the chemical technology of the enamel industry Enamel manufacture and the function of clay in the enamel Purple of cassius, its theory and technology. The examination of cast iron enamels The stiffening of enamels when ground moist by means of vehicles An article dealing with the heating and pickling of the rough iron wares in the enamel industry Recent investigations on the pickling processes The calculation of the chemical composition of an enamel from the mixed raw materials On the technological history of tinning The recovery of tin from tinned waste. The danger of lead compounds to industry and the household. On tin disease, or tin pest The procedure in an enamel works. The educational training of managers for enamel works and the scarcity of technical schools for the German and Austro-Hungarian enamel industry

GRUNWALD, JULIUS. The Theory and Practice of Enamelling on Iron and Steel. Translated by Herbert H. Hodgson, M.A, B Sc, Ph D. With historical notes on the use of enamel. 131 p 8 vo 1910 **$3.00**

This treatise is from the pen of a German technologist of wide experience in enamel works, and who is now the chief chemist and director of large works in the French centre of the industry.

CONTENTS Introduction The raw materials Preparation of the enamel. Preparation of the crude ware. The process of enamelling. Firing the enamelled wares The decoration of enamelled objects—painting Decoration of enamelled objects- photo ceramics Statistics and general information Appendix—Short history of the art of enamelling Index

GUEST, J. J. Grinding Machinery. 444 p. 8 vo. il. 1915. **$5.75**

CONTENTS Grinding and manufacturing. Abrasives and the wheel: The wheel and the work. The work and the machine. Detail of parts. Plain grinders and external work. Internal grinders and their work The universal grinder and its work Surface grinding Sharpening cutters and tools. Form grinding and curved surfaces. Polishing and lapping Measuring and its basis. Appendix.

GUILLIERMOND, ALEXANDRE. The Yeasts. Translated and thoroughly revised in collaboration with the original author. By Fred Wilbur Tanner. 424 p. 8 vo. 163 il. 1920 **$6.00**

The first definitive treatise on the yeasts as such. While this translation is based on the 1912 French edition, Prof Guilliermond collaborated with the translator in adding the new material which has developed in this fast growing subject

CONTENTS: Morphology and development of the yeasts; Physiology, nutrition, respiration, and alcoholic fermentation, Origin of the yeasts; Their position in classifications of the fungi and their systematic relationships; Methods of culture and isolation of yeasts; Procedures for observation; Methods for the characterization and identification of yeasts; Variation of species; Classification of the yeasts; Family of non saccharomycetes, Family of non-saccharomycetes or doubtful yeasts; Pathogenic yeasts; Fungi related to the yeasts. Bibliographical index. Index of names. Index.

GULLIVER, G. H **Metallic Alloys**; their structure and constitution Third edition, revised and enlarged. 436 p. 12 mo. il. 1919. **$4.50**

Contents: Methods of investigation The physico chemical equilibrium of mixed substances. Binary alloys in which no definite chemical compounds are formed Binary alloys which show evidence of the formation of definite chemical compounds Transformations which take place in completely solid metals and alloys. Equilibrium conditions in metallic mixtures The structure of metals and alloys The bronzes, the brasses, and other alloys of copper Steel, and other alloys of iron. Alloys of more than two metals. The microscope in engineering practice. Index.

GUTHRIE, E. SEWALL. **The Book of Butter**; a text on the nature, manufacture and marketing of the product. (Rural text book ser.) 270 p. 12 mo il 1918. **$1.75**

Index. Author is professor of dairy industry, New York State College of Agriculture, Cornell University.

GUTTENTAG, W. E. **Petrol and Petroleum Spirits.** A description of their sources, preparation, examination and uses. With a preface by Prof Sir John Cadman. 135 p. 12 mo. 1918. **$3.75**

Contents: Introductory, Petroleum, Petrol, Petrol Other sources; Examination and testing; Further properties; Uses; Appendices.

HAAS, PAUL, and HILL, T. A. **An Introduction to the Chemistry of Plant Products.** (In two volumes. Vol I—On the Nature and Significance of the Commoner Organic Compounds of Plants.) Vol. II in preparation. Third edition 427 p. 8 vo. 1921. **$5.50**

Contents Fats, oils and waxes; Phosphatides; Aldehydes, Carbohydrates, Glucosides, Tannins, Pigments, Nitrogen bases, The colloidal state, Proteins, Enzymes

HACKH, INGO W. D. **Chemical Reactions and Their Equations.** 138 p. 12 mo. 1921. **$1.75**

Contents: Symbols, Formulas, Equations (Involving no Oxidation and Reduction), Equations (Involving Oxidation and Reduction), Reactions and Their Control; Types of Chemical Reactions and Equations; Appendix

HAEDER, HERMAN. **Handbook of the Steam Engine.** Fourth edition. 458 p. 12 mo. il. 1914. **$3.75**

HAENIG, A. **Emery and the Emery Industry.** A technical study of modern abrasives and the development of the modern grinding-machine industry. Translated by C. Salter. 114 p. 12 mo. il. 1912 **$2.50**

HAGER, DORSEY. **Practical Oil Geology.** 250 p. 12 mo. il. 1919. **$3.00**

This new edition is considerably enlarged There are two new chapters, one on oil shales, the other on geological field methods and instruments.

Contents: Petroleum Stratigraphy. Structural geology. Prospecting and mapping Locating drill hole sites Factors in oil well drilling Factors in oil production. Water. Natural gas. Oil shales. Geological field methods. Cautions

HALDANE, J. S. **Methods of Air Analysis.** 130 p. 12 mo il. 1912. **$2.00**

HALE, ARTHUR J. **The Applications of Electrolysis in Chemical Industry.** 148 p. 8 vo. il. 1918 **$2.65**

Contents: Introduction. Methods of generating the current. Electrolytic refining of metals Electrolytic winning of metals Electrolysis of alkali chlorides, chlorides and caustic soda Hypochlorites, chlorates, perchlorates Production of inorganic compounds. Production of organic compounds Indexes.

HALE, ARTHUR J. **The Manufacture of Chemicals by Electrolysis.** 8vo. 1920. **$2.00**

HALE, ARTHUR J. **Synthetic Use of Metals in Organic Chemistry.** 169 p. 12 mo. 1914. **$1.50**

HALE, WILLIAM J. **The Calculations of General Chemistry with Definitions, Explanations, and Problems.** Second Edition, Revised. 275 p. 12 mo 1909. **$1.50**

Contents: Units of Measurement Density and Specific Gravity. The Effect of Pressure upon Gases The Effect of Temperature upon Gases. The Combined Effect of Pressure and Temperature on Gases. Partial Pressures Avogadro's Hypothesis and Some of Its Applications The Law of Definite Proportions The Derivation of Chemical Formulæ Calculations Depending upon Chemical Equations Normal Solutions Combinations between Gases by Volume Complex Equations. Tables.

HALL, A. D. **Fertilizers and Manures.** 384 p. il. 1909. **$2.50**

Contents: Introductory, Fertilizers containing nitrogen, The function and comparative value of nitrogenous manures, Phosphatic manures. The function and use of phosphatic fertilizers, The potassic fertilizers, Farmyard manure, Peruvian guano and other mixed fertilizers, Materials of indirect fertilizing value, Theories of fertilizer action; Systems of manuring crops; The valuation and purchase of fertilizers; The conduct of experiments with fertilizers

HALL, A. D. **The Soil: An Introduction to the Scientific Study of the Growth of Crops.** 352 p. il. Third edition, revised and enlarged. 1920. **$2.00**

Contents: Introductory, The Origin of soils; The mechanical analysis of soils; The texture of the soil; Tillage and the movements of soil water, The temperature of the soil; Chemical analysis of soils; The living organisms of the soil; The power of the soil to absorb salts; Causes of fertility and sterility of soils; Soil types; Appendices; Index

HALL, C. H. **Chemistry of Paints and Paint Vehicles.** 140 p. 12 mo. il. 1906. **$2.00**

Contents: Determination of the Elementary Constituents of Paints, Raw Materials; Properties, Tests and Methods of Analysis, Analysis of Dry Colors, Pastes and Liquid Paints; Matching of Samples; *Paint Vehicles.* Oils, Varnishes, Japans and Driers, Thinners.

The author has attempted to sift from the great mass of analytical chemistry those methods which apply particularly to the analysis of paints, at the same time calling attention to the most important physical characteristics of the raw materials. This book, being written from the standpoint of a chemist, employed in the manufacture of paints and colors, the chapter on Matching Samples has been included in an attempt to bridge the space between the laboratory and the factory It is here that so often the results of previous analysis are rendered worthless by being placed in the hands of one who does not understand their interpretation nor the composition of the raw materials which he is using.

HALL, J. H. **The Steel Foundry.** By John Howe Hall, Consulting Engineer. 271 p. 8 vo. il. 1914. **$3.50**

It aims to give the characteristics of steel castings from a manufacturing point of view, the details of the various steel manufacturing processes and their characteristics as applied to the different types of castings, including relative cost of installation, relative cost and quality of steel produced, etc; foundry procedure, such as moulding, pouring, annealing, etc

Contents: I.—Introductory II —General considerations governing the choice of a method of steel making III —The crucible process IV —The Bessemer process. V - The open hearth process VI.—The electric furnace VII —Summary; special deoxidizers, ladles VIII.—Moulding Pouring and digging out IX —Heat treatment and annealing. X —Finishing, straightening and welding. XI.—Laboratories. XII. "Building up" impurities in steel.

HALLIGAN, JAMES EDWARD. **Fertility and Fertilizer Hints.** 155 p. 8 vo. il. 1911. **$1.50**

Contents Chemical elements needed by plants, and the composition of plants, The fertility of the soil, Maintaining soil fertility, Farm manures, High grade nitrogenous materials, Low grade nitrogenous materials and functions of nitrogen, Phosphates, Superphosphates and effect of phosphoric acid; Potash fertilizers, Miscellaneous fertilizer materials; Lime, gypsum and green manures, Commercial fertilizers; Valuation of fertilizers; Home mixtures, A few remarks about fertilizers.

HALLIGAN, J. E. **Soil Fertility and Fertilizers.** By James Edward Halligan, Chemist in Charge, Louisiana State Experiment Station, Baton Rouge, La. 398 p. 8 vo. il. 1912 **$4.00**

Contents: Chapter I—Chemical elements needed by plants and the composition of plants. Chapter II—The fertility of the soil. Chapter III—Maintaining soil fertility Chapter IV—Farm manures. Chapter V—High grade nitrogenous materials Chapter VI—Low grade nitrogenous materials and functions of nitrogen Chapter VII—Phosphates. Chapter VIII—Superphosphates and effect of phosphoric acid Chapter IX—Potash fertilizers Chapter X—Miscellaneous fertilizer materials. Chapter XI—Lime, gypsum and green manures Chapter XII—Commercial fertilizers. Chapter XIII—Valuation of fertilizers Chapter XIV—High, medium and low grade fertilizers Chapter XV—Home mixtures Chapter XVI—A few remarks about fertilizers. Chapter XVII—Fertilizer formulas for crops Appendix—The agricultural experiment stations. How to collect an exhibit of fertilizer materials Fertilizer constituents in feed stuffs

HALSE, EDWARD. **A Dictionary of Spanish and Spanish-American Mining, Metallurgical, and Allied Terms.** Second edition. 380 p. 12 mo. il. 1914. **$4.00**

The book is much more comprehensive than its title indicates. It gives a vocabulary of technical mining engineering terms used in Mexico, Columbia, other parts of Latin America, and Spain The dictionary contains many words in common use in or around mines, however slight may be their connection with the technical side of the language. French and Portuguese, and even German equivalents, are introduced wherever possible, and words are often traced to their original meaning This book is indispensable to those who enter Latin America with the serious intention of prospering through the mineral riches of those countries

HALSEY, F. A. **The Use of the Slide Rule.** Fourth edition, revised and enlarged. 96 p 16 mo. il. 1915 **$0.75**

Contents: Principle of the slide rule; Mechanical addition; Multiplication; Multiplication of mixed numbers; Finding the decimal point; Division, Multiplying by vulgar fractions; The runner, Reducing vulgar fractions to decimals; Squares and square roots; Areas of circles; Slide rule formulas; Gage points, The inverted slide; The circular slide rule; Extended scale instruments, Special slide rules, Some special forms of computers; Calculating cone pulleys and back gearing ratios.

HAMILTON, DOUGLAS T., and OBERG, ERIK VALDEMAR. **Electric Welding**; a comprehensive treatise on the practice of the various resistance and arc welding processes, covering descriptions of the machines and apparatus used and the applications both in manufacturing and repair work. 294 p. 8 vo., il. 1918. **$2.50**

HAMILTON, DOUGLAS T. **Gages, Gaging and Inspection.** 295 p. 8 vo. il 1918. **$2.50**

HAMILTON, E. M. **Manual of Cyanidation.** 260 p. Pocket size, flexible. il. 1920. **$3.00**

Contents: I —Notes on the Chemistry of the Process II —Testing and Analysis of Solutions. III —Sand Leaching IV —Shine Treatment V —Milling in Cyanide Solution. VI —VII —VIII.—Discrepancies Between Actual Recovery and Theoretical Extraction IX.—Ores Presenting Special Difficulties. X —Precipitation. XI —Cleaning up and Melting. XII.—Laboratory Experiments. XIII.—Cost Sheets and Plant Data. XIV.—Tables.

HAMILTON, H. **Scientific Treatise on Smoke Abatement.** 155 p. 8 vo. il. 1917. **$2.00**

This comprehensive, well illustrated work, although anticipating the requirements of the sanitary engineer and smoke inspector, is also admirably adapted to the needs of the works manager and the general reader.

Reviewed in *Iron & coal trade review,* Aug. 31, 1917; *Practical engineer* (London), Aug. 30, 1917; *Chemical trade journal,* Aug. 11, 1917.

HAMMARSTEN, OLAF, and HEDIN, SVEN. A Text-Book of Physiological Chemistry. By Olaf Hammarsten, Emeritus Professor of Medical and Physiological Chemistry, in the University of Upsala, with the Collaboration of S. C. Hedin, Professor of Medical and Physiological Chemistry in the University of Upsala. Authorized translation from the Author's enlarged and revised eighth German edition by John A. Mandel, Sc.D., Professor of Chemistry in the New York University and Bellevue, Hospital Medical College. 1026 p. 8 vo. il. 1914 **$5.00**

CONTENTS: General and physico-chemical. The proteins. The carbohydrates. Animal fats and phosphatides. The blood. Chyle, lymph, transudates and exudates. The liver. Digestion. Tissues of the connective substance. The muscles. Brain and nerves. Organs of generation. The milk. The urine. The skin and its secretions. Respiration and oxidation. Metabolism. Index to authors. General index.

HAMOR, WILLIAM A., and PADGETT, FRED W. The Technical Examination of Crude Petroleum, Petroleum Products and Natural Gas. 591 p. 8 vo. 114 il. 1920. **$6.00**

A manual on analytical bitumenology. The book presents the methods now in use for the technical examination and evaluation of the hydrocarbon complexes, natural gas, crude petroleum and oil shale and other commercially important products. It makes readily available to chemists and engineers the procedures of applying the physical and chemical tests which are recognized as essential by technologists.

Because of the significance of benzol and of benzol gasoline mixtures as motor fuels, a chapter is devoted to the laboratory methods in use in the control of the operation of benzol recovery plants.

The Appendix is really a handbook in itself, presenting in compact form all the physical and chemical reference data most needed by the refinery chemist, the petroleum engineer and the gas engineer.

CONTENTS: I. The examination and evaluation of crude petroleum. II. The examination of petroleum naphtha products. III. The examination of illuminating oils. IV. The examination of lubricating oils and greases. V. The examination of bituminous road materials. VI. The examination of other products of petroleum. VII. The sampling of petroleum oils. VIII. The evaluation of oil shale. IX. Laboratory methods for benzol recovery plant operation. X. The examination of natural gas. Appendix.

HANAUSEK, T. F. Microscopy of Technical Products. By Dr. T. F. Hanausek, formerly Professor of Natural History at Vienna, Analyst of the Government Food Laboratory at Vienna. Revised by the Author and translated by Andrew L. Winton, Ph.D., with the Collaboration of Kate G. Barber, Ph.D. 471 p. 8 vo. il. 1907. **$5.00**

It teaches the technical worker how to investigate microscopically commercial raw materials with reference to their composition and suitability for technical purposes.

CONTENTS: Part I.—Apparatus and methods. The microscope. Micro technique. Part II.—Microscopy of raw materials. Starch, inulin. Vegetable fibers. Animal fibers. Mineral fibers. Textiles. Stems and roots. Leaves. Flowers. Fruits and seeds. Teeth, bone, horn, etc. Microchemical analysis.

Handbook of Chemistry and Physics. A ready-reference pocket book of chemical and physical data. Sixth edition. 1917. **$2.00**

Handbook of Milling Details; Compiled from the Engineering and Mining Journal. 425 p. 8 vo. 1914. **$4.00**

Handbook of Mining Details; Compiled from the Engineering and Mining Journal. 372 p. 8 vo. 1912. **$4.00**

HANNAN, WILLIAM I. The Textile Fibers of Commerce. 236 p. 8 vo. il. 1902. **$3.50**

A handbook on the occurrence, distribution, preparation and uses of the animal, vegetable, and mineral fibers used in cotton, woollen, paper, silk, brush, and hat manufactures.

CONTENTS: Introductory. Vegetable fibers, Vegetable silk, cotton, paper fiber plants, brush and hat materials. Animal fibers. silk, wool; hat and fur felting fibers. Hat manufacture. Mineral fiber. Asbestos. Appendix. Index.

HARBORD, F. W., and HALL, J. W. The Metallurgy of Steel. Fifth edition, enlarged and revised. 933 p. 2 vols. 8 vo. il. 1916. **$15.00**

This work has been gradually increased in size until it has become necessary to divide it into two volumes, the first dealing with the manufacture and metallurgy of steel and the physical properties of finished steel, and the second volume covering the matter dealt with in former editions by J. W. Hall in the section on the Mechanical Treatment of Steel. The scheme of the work has not been altered, but only such additions and modifications have been made as have been rendered necessary by the advancement in the theory and practice of the art.

CONTENTS: Volume I.—The manufacture of steel.—The Bessemer process. The basic process. Manufacture of steel in small converters. Chemistry of the acid Bessemer process. Chemistry of the basic Bessemer process. Gas producers. The open hearth or Siemens process. Basic Siemens process. The production of steel castings. The production of shear and crucible steel. Electric smelting of steel. Armor plate manufacture. Direct processes of steel manufacture. Finished steel.—Mechanical testing of materials. Carbon and iron. The influence of S, Si, P, Mn, As, Cu, Sn, Sb, etc., on the physical properties of steel. Special steels or steel alloys. Heat treatment of steel. Microscopical examination of steel. Typical steel plants. Photo-micrographs. Appendices. Index.

Volume II.—The mechanical treatment of steel.—General principles. Reheating furnaces. Handling material at the reheating furnaces. Details of rolling mills. The five leading types of mills. The operation of rolling. Rolls for three high mills. Special mills. Handling material at the rolls. The supply of power. Common mills. Their uses and outputs. Rod mills, continuous billet, bar, and strip mills. Handling materials in the stock yard. Laying-out of the mill. Forging steel by the steam hammer. Forging steel by the press. Compressing steel while fluid. Tube-making. Wire-drawing. Protecting steel from corrosion. Index.

HARDING, L. A., and WILLARD, A. C. Mechanical Equipment of Buildings; a reference book for engineers and architects. 2 vols. 8 vo. il. 1916-1917. Vol. I **$6.00**
Vol. II **$7.00**

Volume I, comprising over 600 pages, deals with heating and ventilation only, and is stated "to contain sufficient theoretical and commercial data for practical use in the designing room, and at the same time to show the student the relation between the theoretical principles involved and their practical application to actual problems." There are special chapters on the heating of water for tanks and pools, on draft and chimneys, electric heating, air conditioning, and exhaust steam heating. Chapter 20 describes in detail the various pipes and fittings, and chapter 21 treats of plans and specifications. Unusually well illustrated.

The second volume, dealing exhaustively with steam plants and ice and refrigeration machinery, contains a large amount of theoretical and commercial data and discussions of their practical applications. Unusually well illustrated with line drawings and charts. Many practical problems are solved step by step.

HARLOFF, W. H. T., and SCHMIDT, H. Plantation White Sugar Manufacture. 138 p. 12 mo. il. 1911. **$5.00**

This is the book of the minute for cane sugar men. Gives a practical insight into the most generally adopted methods of preparing white sugar, describing the processes of juice purification and the factory plants employed. Part I.—The chemistry of white sugar manufacture. Part II.—The manufacture of white sugar. Furnished also in Spanish at the same price.

HARPER, JOSEPH H. Hydraulic Tables; for the flow of water in circular pipes under pressure, timber flumes, open channels, and egg shaped conduits, with much accessory information. 192 p. 16 mo. il. 1916. **$2.00**

This handbook aims "to cover the hydraulic field with a network or grill of solved problems, wherein one may find something that will lie tolerably near any question that may arise, regarding the flow of water in either closed or open conduits, with any reasonable assumption of rugosity and with any rational arrangement of grade, in quantities from a small fraction of a foot to several thousand feet per second." Part seven discusses the several well known formulæ, while the twenty two charts in the appendix show graphically the comparative results.

HARRIS, E. G. Compressed Air. Theory and Computations. By Elmo G. Harris, C.E., Professor of Civil Engineering, Missouri School of Mines, in charge of Compressed Air and Hydraulics, Mem. Am. Soc. C.E. Second edition, revised and enlarged. 192 p. 8 vo. il. 1917. **$2.50**

An authoritative work that has been especially useful because of the charts, tables, and clear, concise discussion of fundamental theory.

The second edition represents a thorough revision and an enlargement, consisting of a new chapter on "Centrifugal Fans and Turbine Compressors", also an appendix on the Design of Logarithmic Charts.

CONTENTS: I. Formulas for work. II. Measurements of air. III.—Friction in air pipes. IV.—Other air compressors. V.—Special applications of compressed air. VI.—The air lift pump. VII. Receivers and storage of compressed air. VIII.—Fans. IX. Centrifugal or turbo air compressors. X. Rotary blowers. XI.—Examples and exercises. Appendices, A, Drill capacity tables, B, Design of logarithmic charts; C, Determination of friction motors; D, Oil differential gage.

HARROW, BENJAMIN. Eminent Chemists of Our Time. 250 p. 8 vo. il. 1921. **$2.50**

A non technical account of the more remarkable achievements in the realm of chemistry as exemplified by the life and work of the more modern chemists. There is hardly a chemist of note whose work is not mentioned in connection with one or another of the eleven following: Richards and Atomic Weights, Ramsay and the Gases of the Atmosphere; Van't Hoff and Physical Chemistry, Arrhenius and the Theory of Electrolytic Dissociation, Moissan and the Electric Furnace; Curie and Radium; Victor Meyer and the Rise of Organic Chemistry; Remsen and the Rise of Chemistry in America, Fisher and the Chemistry of Foods.

HARROW, BENJAMIN. Vitamins. 219 p. il. 8 vo. 1921. **$2.50**

CONTENTS: Introduction, Calories, Carbohydrates, Fats, Proteins, Mineral matter, Water and oxygen; Aminoacids; Glycogen or animal starch; Soap and glycerin, Vitamins; Vitamins and plant growth; Vitamins and beriberi; Vitamins and rickets, Vitamins and scurvy; Vitamins and pellegra, Summary. Practical applications; Appendix; References, Index.

HART, E. B., and TOTTINGHAM, W. E. General Agricultural Chemistry. By Edwin B. Hart, B.S., Professor of Agricultural Chemistry, and William E. Tottingham, M.S., Assistant Professor of Agricultural Chemistry, University of Wisconsin. 344 p. 12 mo. il. 1913. **$2.50**

A simple, clear discussion of the general field of chemistry applied to agriculture with the emphasis on the applied side. It is designed for the young farmer and the student beginning the study of agricultural chemistry.

CONTENTS: The atmosphere. The soil. Natural waters. The plant. Farm manure. Commercial fertilizers. Crops. The animal body. Feeding standards. Food requirements of animals. Milk and its products. Insecticides and related substances.

HART, R. N. Leavening Agents. Yeast, leaven, salt-rising fermentation, baking powder, aerated bread, milk powder. By Richard N. Hart, B.S. 90 p. 8 vo. il. 1918. **$1.50**

CONTENTS: Yeast. Fermentation and its cause. Life and characteristics of yeast. Activities of yeast—breathing, nutrition, fermentation. Selection—Hansen's pure culture. Keeping of yeast. Tests for yeast. Manufacture of compressed yeast. Old Vienna, process—materials, disturbance in fermentation. Aeration process—materials, disturbances in fermentation. Yeast in bread. Leaven and homemade yeast. Salt rising fermentation. Baking powders. General. The alkali. The acid—cream of tartar, phosphate, aluminum salts. Starch. General. Kind of flour. Care of baking powders. Miscellaneous substitutes. Residues in the bread. Manufacture. Analysis. General. Aerated bread. Milk powder.

HART, R. N. Welding. Theory, Practice, Apparatus and Tests, Electric, Thermit and Hot Flame Processes. By Richard N. Hart, B.S. Second edition, revised, enlarged and reset. 210 p. 8 vo. il. 1914. **$2.50**

A thorough treatise covering first the metals and then the processes. It presents valuable data on costs and tests, collected from all sources.

HARVEY, ARTHUR. Practical Leather Chemistry. A Handbook of Laboratory Notes and Methods for the Use of Students and Works' Chemists. 210 p. il. 1920. **$6.00**

CONTENTS: Water analysis; Analysis of lime; Analysis of sodium and arsenic sulphides; Estimation of nitrogen, Analysis of lime liquors; Analysis of limed pelt; Analysis of lactic acid; Other deliming agents, Single bath chrome liquors, Two bath chrome tanning; Commercial egg yolk, Soap analysis, Oils, fats and waxes; The tannins (qualitative); The tannins (quantitative), Tan liquors, Leather analysis; Finishing materials, Natural dyestuffs, Coal tar dyes. Appendix Index

HASKELL, ALLAN C. How to Make and Use Graphic Charts. 539 p. 8 vo. il. 1919. **$5.00**

HASKINS, HOWARD D. Organic Chemistry. Third edition, revised. 472 p 8 vo. 25 il. 1917. **$3.00**

The work presents in the simplest manner the facts of organic and physical chemistry which bear essentially on medical science, for medical students Numerous practical exercises accompany the text.

HASSACK, PAUL. Vinegar Bulletin. The manufacture of fermented vinegar. A complete illustrated encyclopedia covering all phases in the manufacture of spirit, cider, malt and grape vinegar 250 p. 4 to il 1918. **$18.75**

CONTENTS. Theoretical versa practical yield in the oxydation of alcohol into acetic acid by fermentation, A modern automatic device for vinegar generators of large diameter, Melon vinegar, The manufacture of malt vinegar, The utilization of the apple, Acid resisting material important in the manufacture of cider, wine, vinegar, the canning, preserving and chemical industries, The manufacture of spirit vinegar; Wine or grape vinegar, Natural fermented syrup and molasses vinegar, Vinegar specialties, Conclusion.

HATFIELD, W. H. Cast Iron in the Light of Recent Research. 249 p. 8 vo. il. 1912. **$4.00**

This work is the result of the author's own investigations in this field and embodies many years' practical experience It presents in a single volume results of many researches on the nature and properties of cast and malleable cast iron and the scientific principles underlying their manufacture

CONTENTS Introduction The iron carbon alloys and cast iron from the standpoint of the equilibrium diagram The influence of silicon The influence of phosphorus The influence of sulphur. The influence of manganese The influence of other elements upon the properties of cast iron. Influence of casting temperature shrinkage and contraction in cast iron The growth of cast irons during repeated heatings The effect of superheated steam upon cast iron fittings, etc Malleable cast iron The heat treatment of cast iron The decarburisation of cast iron without further fusion The mechanical properties of cast and malleable cast iron Furnaces and slags Appendices Index.

HATSCHEK, EMIL. Introduction to the Physics and Chemistry of Colloids. Third edition 107 p 12 mo. 1919. **$1.50**

HATSCHEK, EMIL. Laboratory Manual of Elementary Colloid Chemistry. 135 p 8 vo 1920. **$2.00**

HATT, WM. K., and SCOFIELD, H. H. Laboratory Manual of Testing Materials. New second edition. 176 p 8 vo il. 1920. **$2.00**

A thorough revision of this widely used manual The methods of tests, specifications and related data have been brought strictly up to date This has been especially necessary in the field of concrete, where developments in recent years have been so rapid

CONTENTS I General II General instructions III Definitions IV. Materials stressed beyond the elastic limit V Testing and testing-machines. VI List of experiments VII Instructions for performing experiments: 1 Testing machines 2 Iron and steel 3 Testing of wood 4 Tests of cements 5 Study of aggregates 6 Proportioning mortars and concretes. 7 Tests of concrete and other brittle materials. 8. Tests of road materials

HAUSBRAND, E. Drying by Means of Air and Steam. With explanations, formulas, and tables for use in practice. Translated from the German by A. C. Wright. 77 p. 12 mo. il 1917. **$2.50**

CONTENTS Comparison between English and metric systems and the Centrifugal and Fahrenheit thermometers, Tables and calculations: Drying apparatus; Drying by superheated steam, Heating surface, Velocity of air current, Dimensions of drying room, Surface of the drying material, Losses of heat

HAUSBRAND, E. Evaporating, Condensing and Cooling Apparatus. Explanation, formulas and tables for use in practice. Translated from the Second Revised German Edition by A. C. Wright. 26 il, 76 tables. 400 p 8 vo. 1919. **$6.00**

CONTENTS: The coefficient of transmission of heat, and the mean temperature difference, Parallel and opposite currents, Apparatus for heating with direct fire, Injection of saturated steam, Superheated steam; Evaporation by means of hot liquids, Transference of heat; Evaporation in a vacuum, Multiple-effect evaporator, Weight of water which must be evaporated from 100 kilos of liquor in order to bring its original percentage of solids from 1 25 per cent up to 20 70 per cent; Relative proportion of the heating surfaces in the elements of the multiple evaporator and their real dimensions, Pressure exerted by currents of steam and air upon floating drops of water, Motion of floating drops of water; Splashing of evaporating liquids, The diameter of pipes for steam, alcohol vapor and air, Diameter of water pipes; Loss of heat from apparatus and pipes, Condensers, Heating liquids by steam; Cooling of liquids; The volumes to be exhausted from condensers; Air pumps and the vacua they produce, Volumetric efficiency of air-pumps, The volumes of air which must be exhausted from a vessel in order to reduce its original pressure to a certain lower pressure; Tables.

HAUSNER, A. Manufacture of Preserved Foods and Sweetmeats. A handbook of all the processes for the preservation of flesh, fruit, and vegetables, and for the preparation of dried fruit, dried vegetables, marmalades, fruit-syrups, and fermented beverages, and of all kinds of candies, candied fruit, sweetmeats, rocks, drops, dragees, pralines, etc. Translated from the Third Enlarged German Edition by Arthur Morris and Herbert Robson, B.Sc. 231 p. 12 mo. il. 1912. **$3.50**

CONTENTS: Causes of Putrefaction of Food; Composition of Food; Decomposition; Various Methods of Preserving; Meats; Eggs; Milk; Fat; Vegetable Foods; Fruits; Manufacture of Jam and Jellies; Manufacture of Candied Fruit; Caramelized Fruit; Bonbon Making; Fruit Drops; Machinery and Appliances for Candy-making; Oils in Candy-making; Recipes, etc.

HAVARD, F. T. Refractories and Furnaces. Properties, preparation and application. By F. T. Havard, E.M., late Associate Professor of Metallurgy, University of Wisconsin. 380 p. 8 vo. il. 1912. **$5.00**

A comprehensive study of the physical and chemical properties of materials used in the construction of industrial furnaces.

CONTENTS Notes on the history and development of the fire clay and refractories industry. I.—Classification of refractory materials. II.—The relation between slags and refractory vessels and linings. III.—The preparation of the silicious refractories. IV.—The preparation of the refractory clays. V.—The preparation of the basic and neutral refractories. VI.—The use of refractory materials in the metallurgy of iron and steel VII.—Refractories used in the metallurgy of copper. VIII.—Refractories used in the metallurgy of lead and silver and in general metallurgical practice. IX.—Refractories used in the chemical and electro metallurgical industries X.—Some instances of application of common and refractory bricks in industrial furnaces XI.—Directions in constructing furnaces. XII.—Refractory hollow ware XIII.—Testing of refractory products and refractory raw materials XIV.—The thermo-physical properties of furnace materials. XV.—Heat measurements in the metallurgical and refractories industry. XVI.—The preparation of common brick.

HAWAIIAN CHEMISTS' ASSOCIATION. Methods of Chemical Control in Cane Sugar Factories. 103 p. 8 vo. il. 1916. **$3.00**

Describes the latest methods of chemical control as adopted by the Hawaiian sugar factories. The various apparatus used in the control work is fully described and illustrated A chapter is devoted to the preparation of reagents that are used Concludes with 16 numerical tables used in the control, many of them especially calculated for the purpose

HAWLEY, L. F. Wood Distillation. American Chemical Society Monograph. In preparation.

HAYS, J. W. Combustion and Smokeless Furnaces. 118 p. 8 vo. il. 1915. **$2.00**

CONTENTS Heat and combustion, Combustion and the boiler furnace, Combustion and the steam boiler, The chimney evil, Smokeless furnaces in general; Mechanical stokers, Hand fired furnaces, Some conclusions, Index.

HEATH, G. L. The Analysis of Copper. Including the ores and principal alloys By George L Heath, Chief Chemist, Calumet & Hecla Smelting Works. 292 p 8 vo il. 1916 **$3.00**

This volume constitutes the first connected account of the principal methods employed by the largest refineries, foundries, and custom sampling works for the control of operations and valuation of material, following the logical sequence from the ore in the mine to the finished metallic product The book is intended primarily for the technical chemist and advanced students, but will be of value to all interested in the subject

HEERMANN, P. Dyers' Materials. An introduction to the examination, valuation, and application of the most important substances used in dyeing, printing, bleaching and finishing. Second edition, revised and enlarged by H B Stocks 158 p 16 mo il 1919 **$3.00**

CONTENTS: Indicators; Standard solutions and reagents; Water; Textile fibers, Hydrochloric acid and the chlorides, Fluorides and bifluorides, Sulphuric acid and sulphates, Nitric acids and nitrates; Chlorine, Oxygen compounds, Sulphites, Alkalies, Peroxides, Zinc dust; Fatty acids and their salts, Cyanogen compounds, Derivatives of fats, Aniline and aniline salts; Thickening material dyes.

HEESS, J. K. Practical Methods for the Iron and Steel Works Chemist. Dr. Heess is Chief Chemist for the Carnegie Steel Company, New Castle, Pa. 60 p. 8 vo. 1918 **$1.25**

CONTENTS Part I—The laboratory General information. Miscellaneous notes Standards Elements used in this work Table of factors Table of molecular formulæ and molecular weights. Information to aid in rapid calculations. Standard solutions and reagents. Part II—Iron ores Coke and coal. Limestone Blast furnace slag. Iron Steel Gravimetric method for Mn in ferro manganese Gravimetric method for Mn in ores, iron, steel and spiegel. Gravimetric method for phosphorus Gravimetric method for sulphur in iron and steel. Carbon in iron and steel by combustion Phosphorus in ores, etc, containing as Ferro-manganese. Ferro-silicon. Slags and cinders. Fluorspar Fire stone, fire sand, ganister, mica schist, etc. Fire-brick, fire clay and kaolin Portland cement Chromium and tungsten in steel Analysis of water for boiler purposes Determination of tallow fat in cylinder oils. Gas analysis: Blast furnace and chimney gases, Producer and coke oven gases Bearing metals: Alloys containing Sn, Sb, Cu and Pb; Alloys containing Cu, Sn and Zn.

HEIL, ADOLPH, and ESCH, W. Manufacture of Rubber Goods. 237 p. 8 vo. 1917. **$4.50**

HELDT, P. M. The Gasoline Automobile; its design and construction. Vol. I.—The gasoline motor, with a separately bound plate supplement. Vol. II.—Transmission, running gear and control. Vol. III.—Electrical equipment. 3 vol. 8 vo. il. 1916-1919. **$13.50**

There has been a large amount of revision, with an entirely new chapter on water cooling systems Changes have been made in the sections relating to engine balance, aluminum pistons, tubular connecting rods, forked rods for V engines and crankshafts. It is stated that probably the most important addition is that relating to the accurate calculation of the various types of cams. An attempt has been made to give rules and constants of design both for typical pleasure and commercial car engines. Author is technical editor of the *Horseless age.*

HENDERSON, G. G. Catalysis in Industrial Chemistry. (Monographs on Industrial Chemistry.) Second edition. 202 p. 8 vo. 1921. **$3.40**

CONTENTS: Catalysis and catalysts; Generalities; Autocatalysis; Negative catalysis; Catalyst poisons; Promoters; Preparation of active metals; Hydrogen; Chlorine and chlorine compounds; Graphite; Carbon

tetrachloride and oxychloride; Carbon disulphide; Elimination from coal gas; Sulphur; Sulphuric acid; Sulphuryl chloride; Persulphates; Regeneration of chromic acid; Ammonia; Other compounds of nitrogen, Nitric acid; Hydrogenation: Generalities; Reduction in gaseous systems, Reduction liquid systems; Addition of hydrogen in gaseous systems, Addition of hydrogen liquid systems, Dehydrogenation, Degradation of hydrocarbons; Oxidation, in gaseous systems, Oxidation, liquid systems, Hydration and hydrolysis, Dehydration, Polymerization, Condensation, Preparation of hydrocarbons; Preparation of halogen derivatives, Sulphonation and nitration, Preparation of amine derivatives, Diazo compounds, Preparation of aldehydes and ketones, Preparation of sulphur compounds, Intramolecular rearrangement, Enzymes, Surface combustion, List of catalysts, Index of subjects.

HENDRICK, ELLWOOD. Everyman's Chemistry. 374 p 8 vo. il. 1917. **$2.00**

A delightfully chatty book, containing much accurate information stated in simple language.

HENRICH, FERDINAND. The Theory of Organic Chemistry. Translated and enlarged from the third revised edition by Treat B. Johnson and Dorothy A Hahn. 8 vo. 1921

A comprehensive development of the most fundamental conceptions in regard to atomic relationships in the field of organic chemistry, from earliest times to the present

CONTENTS: The historical development of the theory of organic chemistry up to the period of the theory of types, The early history of structural chemistry, Later developments in structural chemistry, Johannes Thiele's theory of partial valencies, The theory of Alfred Werner; The so-called negative nature of atomic groups of radicals, Recent theories in regard to the mechanism by which molecules interact, Theories in regard to the constitution of benzene, Tautomerism and desmotropism, Ionization, Isomerism, The application of physico chemical principles to organic chemistry, The theoretical speculations of John Ulric Nef; Conceptions in regard to the independent existence of free organic radicals, The relationship between color and chemical constitution, The theory of indicators, Fluorescence in its relation to the chemical constitution of the molecule, Molecular rearrangements; The basic properties of oxygen; The theoretical speculations of Arthur Michael, Recent electrochemical theories.

HENRY, THOMAS A. The Plant Alkaloids. 466 p 8 vo. 1913. **$5.00**

HENSCHIEN, HANS PETER. Packing House and Cold Storage Construction; a general reference work on the planning, construction and equipment of modern American meat packing plants, and a complete treatise on the design of cold storage plants, including refrigeration insulation and cost data 310 p. 8 vo. il. 1916. **$5.00**

This much needed work by an architect who has specialized in this kind of construction is practical and complete carefully following the requirements of the United States Bureau of Animal Industry, the approval of which is necessary for the plans of all new packing plants involving government inspection It is stated that the chapters on cold storage construction "contain information which heretofore has only been available through a close study and investigation of existing buildings or through scattered descriptions and discussions of this subject in current technical journals" The illustrations are carefully done and there are several double page plans

HERING, CARL. Ready Reference Tables. 196 p 8 vo 1904. **$2.50**

Contains conversion factors of every unit or measure in common use The information is conveniently arranged for engineers, physicists, students, merchants, etc

HERING, CARL, and GETMAN, FREDK. H. Standard Table of Electrochemical Equivalents and Their Derivatives. With explanatory text on electro chemical calculations, solutions of typical practical examples and introductory notes on electrochemistry. 138 p. 24 mo il 1917 **$2.00**

CONTENTS: Fundamental Laws; Fundamental Data and Description of the Tables. Table 1 Electrochemical Equivalents by Weight Table 2, Grams per Ampere hour in the Order of Magnitude Table 3 Electrophysical Equivalents by Volume Table 4 Valences of the Elements in Their Combinations; Calculations Involving Electrochemical Equivalents, Examples; Electrolysis, Theory of Electrolytic Dissociation; Faraday's Law; Coulometers; The Electron Theory; *Appendix* Valence; Elementary Principles of Chemical Reaction and Calculations; Conversion Factors Used in Electrochemical Calculations, Glossary of Terms

HERING, RUDOLPH, and GREELEY, SAMUEL A. Collection and Disposal of Municipal Refuse. 653 p. il. 8 vo. 1921. **$7.00**

A comprehensive survey of the methods of collecting, transporting and delivering the different kinds of refuse to the points of disposal and the various means for their sanitary disposition

Wherever cost data are given, the years to which they are applicable have been noted

CONTENTS: Refuse materials House treatment. Collection Supplemental transportation. Estimating the cost of collection and transportation. Outline of methods of final disposal Depositing in water and on land. Feeding garbage to hogs. Sorting rubbish Incineration of refuse. Reduction of garbage Estimating costs of final disposal Selecting the method of disposal Stable refuse Street refuse Night-soil and dead animals Procedure in small towns and villages.

HERINGTON, C. F. Powdered Coal as a Fuel. Second edition, revised and enlarged. 350 p. 8 vo. il 1920 **$4.50**

"Raw coal cannot be compared with powdered coal with respect to efficiency of combustion With proper appliances and methods, the last produces almost smokeless fire with a steady intense heat and maximum furnace temperature." This work by an assistant engineer of the New York Central Railroad describes various patents, designs, and systems, as well as their applications to the cement industry, reverberatory furnaces, metallurgical furnaces, boilers and locomotives. There is a chapter on explosion risks, also a 12-page list of references.

CONTENTS: Introduction; Coals suitable for powdering; Preparation of powdered coal; Feeding and burning powdered coal; Powdered coal in the cement industry; Application of powdered coal to reverberatory furnaces; Powdered coal in metallurgical furnaces; Powdered coal under boilers; Powdered coal for locomotives; Explosions; Effective use of powdered coal in metallurgical furnaces; Recent utilisation of powdered coal in boilers; Tables and useful data; How to operate a pulverized-coal plant; Bibliography.

HERIOT, T. H. P. Manufacture of Sugar from the Cane and Beet. (Monographs on Industrial Chemistry.) 426 p. 8 vo. 1920. **$8.50**

CONTENTS: The raw materials, Extraction of juice from the cane; Extraction of sugar from the beet, Composition of cane and beet juices, Treatment of cane and beet juices, Evaporation of water from the juice, Crystallization, Special methods of extracting sugar from molasses, Refining of cane and beet sugars.

HIBBARD, HENRY D. Manufacture and Uses of Alloy Steels. 96 p. 8 vo 1919. **$1.50**

CONTENTS Definitions Acknowledgment Introduction List of useful alloy steels. Alloy treated steels Structural alloy steels. Simple tungsten steel Simple chromium steel Manganese steel Simple nickel steels Nickel chromium steels Silicon steels High speed tool steels. Chromium vanadium steels.

HICKS, JAS. A. The Laboratory Book of Mineral Oil Testing. Third edition, with introduction by Sir Boverton Redwood. 76 p. 12 mo. il 1918. **$1.50**

CONTENTS: Preliminary Specific gravity Flashing point, Viscosity Color. Sundry apparatus Appendix, Index

HIGGINS, SYDNEY H. The Dyeing Industry. 189 p. 8 vo. 1919. **$3.40**

HILDEBRAND, J. H. Principles of Chemistry. 313 p 12 mo 1918. **$2.25**

HILDITCH, T. P. Concise History of Chemistry. 273 p 12 mo. 1911. **$1.50**

HILL, ARTHUR E. A Brief Laboratory Guide for Qualitative Analysis. Third edition, revised and enlarged. 104 p. Small 12 mo. 1911. **$1.25**

CONTENTS Outline of the scheme, Systematic analysis, Analysis for the metallic radicals, Analysis for the acid radicals, Study of chemical reactions, Metals, Acid radicals, Review questions, Model reports, Concentration of reagents, Dry reagents

HINCHLEY, J. W. Chemical Engineering; notes on grinding, sifting, separating, and transporting solids. 103 p. 12 mo il. 1914. **$3.00**

CONTENTS: Size reduction of solid material, Sifting, Size separation by fluid media; Separation of solids by magnetic methods, Mixing; Transport of solid material.

HIND, H. LLOYD, and PANDLES, W. B. Handbook of Photomicrography. 292 p. 8 vo. 1914. **$2.50**

HIND, R. RENTON. Heat Conservation in Sugar Factories. 149 p. 8 vo. il. 1917. **$2.00**

The experience of the author as engineer in cane sugar factories for over eight years pointed out to him the need of a concise reference work on the subject of heat losses, and this volume has been compiled to aid the sugar house engineer in all departments of the cane sugar factory in which steam is used, including the crushing plant, boiler room and boiling house The object of the book is to show means of remedying adverse conditions throughout the factory

HINDS, J. I. D. Qualitative Chemical Analysis From the Standpoint of Solubilities, Ionization and Mass Action. Second edition. 266 p. 8 vo 1913. **$2.50**

CONTENTS: Principles and methods of qualitative analysis; Introductory, Method of analysis, Separation, Solutions, Reactions, Basic analysis, Silver group; Copper arsenic group, Iron group, Zinc group; Barium group, Magnesium alkali group, Acidic analysis, Properties and reactions of the non metals, Acids and anions, Separation and identification of the acids and anions, Complete analysis of an unkown; Reagents and Tables

HIORNS, A. H. Iron and Steel Manufacture. A Text-book for Beginners. By Arthur H Hiorns London. Fourth edition, completely revised and enlarged 211 p 12 mo 1907. **$1.20**

Presents the fundamental principles of the various processes employed in the manufacture of iron and steel in an elementary manner. Valuable in preparing the beginner for more advanced study.

HIORNS, A. H. Metal-Coloring and Bronzing. By Arthur H. Hiorns, Head of the Metallurgical Department, Birmingham Municipal Technical School. London Second edition. 340 p. 12 mo. 1907. **$2.40**

Brings together in convenient form information from various sources on the subject of metal coloring whether produced by chemical, electro chemical or mechanical processes Many recipes old and new have been thoroughly tested and the results recorded A brief account has been included of the properties of the ordinary metals and their chemical relations with regard to such elements as oxygen, sulphur, chlorine, etc Part I —Chemical effects of the atmosphere, chemical principles and changes, nature and object of metal coloring, II.—Cleaning, dipping, scratch brushing, etc, III Chemical metal coloring; IV —Electro chemical metal coloring and deposition of metals; V.—Electro mechanical metal coloring

HIORNS, A. H. Metallography: An Introduction to the Study of the Structure of Metals, Chiefly by the Aid of the Microscope. By Arthur H. Hiorns. 158 p. 12 mo. 1902. **$2.80**

Illustrates the principles of the subject by a series of original photographs which help to give an idea of the delicate structure of metals as seen through the microscope Most of the photographs give an amplification of from 120 220 diameters The book gives an account of the history and development of metallography, the nature of alloys; the polishing and preparing of specimens, etching, oxidizing and coloring as aids to structure revelations. It includes a concise description of a suitable microscope with appliances for illuminating the sections, and directions for photographing the specimens.

We can obtain for you any book of any publisher at the publisher's own net price

HIORNS, A. H. Mixed Metals, or Metallic Alloys. By Arthur H. Hiorns. Second edition, completely revised and enlarged. 445 p. 12 mo. 1912. $2.80

HIORNS, A. H. Practical Metallurgy and Assaying. A textbook for the use of teachers, students and assayers. By Arthur H Hiorns, Head of the Metallurgy Department, Birmingham Municipal Technical School. London. 490 p. 12 mo. 1906. $2.00

Teaches the principles of metallurgy by means of experiments. Special attention has been given to the analysis of iron and steel. A few elementary experiments have been introduced illustrative of the processes of electro metallurgy, and a short description has been given of a metallurgical laboratory with its necessary fittings and appliances.

HIORNS, A. H. Principles of Metallurgy. By Arthur H. Hiorns. 388 p. 12 mo. 1914. $2.80

Presents a more extended view of the principles of metallurgy than is contained in the author's Elementary Metallurgy. It gives in a simple and succinct form the views of modern metallurgists, and the methods of extracting various metals from their ores. It deals in order with the physical properties of metals, the chemical principles involved in the processes, different kinds of fuel, metallurgy of iron and steel, silver, gold and other metals.

HIORNS, A. H. Steel and Iron, for Advanced Students. By Arthur H. Hiorns 514 p. 12 mo 1903 $3.40

A textbook dealing with the more scientific aspects of the iron and steel industries Although the book deals mainly with general principles, an endeavor has been made to make these as comprehensive as possible. The sub title "for advanced students" is not intended to convey the idea that the book is of a highly advanced character, but that it is designed for the students pursuing a second or third year's course in a college or technical school.

HIORNS, A. H. A Text-Book of Elementary Metallurgy for the Use of Students. By Arthur H. Hiorns, London. Second edition, completely revised. 212 p. 12 mo. 1906 $1.40

An elementary treatise on metallurgy adapted to the capacity of a beginner and dealing rather with principles than with detailed processes.

HISCOX, GARDNER D., ed. Henley's Twentieth Century Book of Recipes, Formulas and Processes. 808 p. 8 vo 1920. $4.00

Among the recipes given are. Bleaching recipes, Etching and engraving recipes; Recipes for glass making, Paper making recipes, Recipes for ointments; Mirror making formulas, Paint making formulas; Gilding recipes; Galvanizing recipes; Bronzing recipes, Tinning recipes; Silvering recipes; Recipes for adhesives, Recipes for plating and enameling; Cleaning processes; Soap making; Leather and its preparation; Recipes for alloys, Recipes for solders, Photographic formulas; Shoe dressing recipes; Stove blacking recipes, Rust preventive recipes; Recipes for lubricants, Recipes for oils, Recipes for dyes, colors, and pigments, Recipes for dryers, Ink recipes; Recipes for artificial gem making; Jewelers' and watchmakers' recipes, Household formulas; Waterproofing recipes, Fireproofing recipes, Recipes for cements, glues, mucilage, Fireworks recipes; Recipes for eradicators; Alcohol and its uses; Recipes for essences and extracts; Dentifrice recipes; Cosmetic recipes, Perfume recipes; Tanning recipes, Metallurgical formulas; Hair restorers, Depilatories.

HISS, A. EMIL, and EBERT, ALBERT E. The New Standard Formulary. 1256 p. 8 vo 1915. $5.00

HODGEN, JOSEPH D. Practical Dental Metallurgy. 436 p. 8 vo. 1918. $2.50

HODGSON, JAMES T. Modern Boiler Room Practice and Smoke Abatement. 321 p. 8 vo. il. 1915. $1.00

A profusely illustrated work describing in simple language the various means and accessories for obtaining maximum power at a minimum cost Has chapters on coal and combustion, firing methods, boiler construction, water supply and purification, saturated steam, piping, coal testing, and instruction for attendants. Chapters 19 and 20 give practical questions and answers

HOFF, J. N. Paint and Varnish Facts and Formulas. A handbook for the maker, dealer, and user of paints and varnishes. Containing over 600 recipes. 179 p. 8 vo $2.00

CONTENTS: White Paints and Pigments; The Oxides of Iron; The Chemical Colors; Classification of Pigments, Colors in Oil, Japan and Water; Oils and Solvents; Varnishes, Ready Mixed Paints; Kalsomines; Paint and Varnish Troubles and Their Remedies; Painting and Decorating; Formulas

HOFMAN, H. O. General Metallurgy. By H. O. Hofman, E.M., Met.E, Ph D, Professor of Metallurgy, Massachusetts Institute of Technology. 909 p. 8 vo. il. 1918 $7.00

A monumental work aiming to cover the field of General Metallurgy as a whole. The good of the older endeavor has been combined with that of modern research, and the whole has been treated from the point of view of the metallurgist who has a leaning toward physical chemistry. Mechanical processes have received more consideration than has been customary, as the tendency of present metallurgical practice is in this direction.

HOFMAN, H. O. Metallurgy of Copper. 556 p. 8 vo. il. 1918. $6.00

It presents first the leading physical and chemical facts about the metal, its alloys and its compounds, and second details of operation throughout the world Professor Hofman visited the leading smelters and refineries of the United States, where he was supplied with every facility for securing the latest data. He collected the scattered literature of the subject, to which he makes copious references, and from all parts of the world received the latest information from the leading plants.

CONTENTS: I.—Introduction II—Properties of copper. III.—Copper of commerce, its impurities and their effects. IV.—Industrial alloys V—Copper compounds. VI.—Copper ores, their metallurgical treatment. VII.—Smelting of copper. A.—Smelting copper sulphide ore: 1. Roasting. 2. Smelting in the blast furnace. 3. Smelting in the reverberatory furnace 4 Smelting in the converter. 5. The sulphide smelting plant. B—Smelting oxide copper ores. C.—Smelting native copper ore. D.—Fire-refining of impure copper. VIII.—Leaching of copper: A.—Leaching of copper ores. B.—Leaching copper matte. C.—Leaching metallic copper. IX.—Electrolysis of copper: A.—Multiple system. B—Series system. C.—Multiple versus series system.

HOFMAN, H. O. The Metallurgy of Lead and the Desilverization of Base Bullion. By H. O. Hofman, Professor of Metallurgy, Massachusetts Institute of Technology. 551 p. 8 vo. il. 1918. $7.00

This standard book has been through many editions and remains to-day the most authoritative work on the metallurgy of lead.

CONTENTS: Part I.—Introduction. Historical and statistical notices. Properties of lead and some of its compounds. Lead ores. Distribution of lead ores. Receiving, sampling and purchasing of ores, flumes and fuel. Part II.—Metallurgical treatment of lead ores. Smelting in the reverberatory furnace Smelting in the ore furnace Smelting in the blast furnace. Part III.—Desilverization of base bullion Pattinson process. Parker process. Cupellation process.

HOFMANN, O. Hydrometallurgy of Silver. By Ottokar Hofmann. 345 p. 8 vo. il. 1907. $4.00

Part I—Chloridizing roasting of silver ores. Chapter I.—Theory of chloridizing roasting. II.—Crushing of the ore. III.—Percentage of salt required IV—Loss of silver by volatilization. V—Methods of roasting VI—Consumption of fuel VII.—Reverberatory furnaces worked by hand VIII Mechanical roasting furnaces IX—Collecting the flue dust. X—Sulphating roasting XI—Chloridizing of argentiferous zinc—lead ore XII.—Chloridizing of calcareous ores Part II Extraction of the silver XIII—Lixiviation of the sodium hyposulphite. XIV—Precipitation of silver. XV—Treatment of the precipitate XVI—Construction of troughs. XVII—Trough lixiviation XVIII.—The Russell and Kiss processes. XIX.—The Augustin process. XX—Extraction with sulphuric acid. XXI.—The Ziervogel process XXII—Treatment of silver ores rich in gold.

HOLDE, D. The Examination of Hydrocarbon Oils and of Saponified Fats and Waxes. By Doctor D Holde. Authorized translation from the fourth German edition, by Edward Mueller, Ph.D, Assistant Professor of Inorganic Chemistry, Massachusetts Institute of Technology. 483 p. 8 vo. il. 1915 $5.00

This book is a complete discussion of the occurrence, treatment, physical and chemical examination, and uses of petroleum and petroleum products, lubricants, natural asphalt, ozokerite, tars from bituminous materials, together with saponifiable fats and technical products

CONTENTS: Petroleum and petroleum products Naphtha, kerosene, gas oils, motor and fuel oils, lubricating oils. Asphalt Ozokerite and montan wax. Distillation products of coal, tar, etc. Saponifiable fats (animal and vegetable fats and oils). Products of the fat industry Waxes.

HOLE, W. The Distribution of Gas. Third edition, 865 p 8 vo. il. 1912. $8.50

A complete and comprehensive treatise embodying all that is required as an outfit on the subject of distribution, not only to students, but also to managers of gas works This new edition has been much enlarged and brought up to date by the addition of much new matter and the careful compression of the old material.

CONTENTS Rights and duties of gas undertakings; Preliminary considerations; Discharges from pipes; Discharges from pipes under high pressure; Station governors; Districting, District governors, Cast iron pipes and irregulars, Steel pipes and connections; Joints and jointing; Main laying, Valves and main cocks; Subways; Service; Wet dry, prepayment, and fixing meters; Pipes and joints for internal fitting; Internal fitting and lighting; Gas fires and cookers; Gas engines, Pressure gauges and registers, Complaints and repairs; Gas as an aid to ventilation. *Public lighting.* Low pressure self intensifying and high-pressure systems; Lighting and extinguishing lamps; High-pressure distribution and transmission, Compressors; High pressure; Distributing apparatus; Internal lighting and heating; Unaccounted-for gas; Fusion and electrolysis, Appendix.

HOLLEMAN, A. F.; WALKER, A. JAMIESON, and MOTT, OWEN E. A Textbook of Organic Chemistry. Fifth English edition, completely revised. 642 p. 8 vo. il. 1920. $3.50

CONTENTS Qualitative and quantitative analysis; Determination of molecular weight, The element carbon, Laboratory methods; Classification of organic compounds; Aliphatic compounds; Saturated hydrocarbons, Alcohols, Alkyl halides, Esters and ethers; Alkyl radicals linked to sulphur, Alkyl radicals linked to nitrogen; Alkyl-radicals linked to other elements, Nitriles and isonitriles Derivatives of the fatty acids obtained by modifying the carboxyl group; Aldehydes and ketones Unsaturated hydrocarbons, Substitution-products of the unsaturated hydrocarbons; Monobasic unsaturated acids, Unsaturated aldehydes and ketones, Compounds containing more than one substituent; Polybasic acids; Substituted acids; Dialdehydes and diketones, Halogen-substituted aldehydes and ketones; Aldehydo-alcohols and keto-alcohols or carbohydrates, Dioses, Amino-aldehydes and amino ketones; Aldehydo-acids and ketonic acids, Amino acids; Proteins, Cyanogen derivatives; Derivatives of carbonic acid, Uric acid group; Cyclic compounds; Alicyclic compounds, Aromatic compounds, Constitution of Benzene, Properties characteristic of the aromatic compounds; Benzene and the aromatic hydrocarbons with saturated side-chains, Monosubstitution products of the aromatic hydrocarbons; Benzene homologues with substituted side chains, Compounds containing an unsaturated side-chain; Polysubstituted benzene derivatives; Orientation of aromatic compounds; Hydrocycle or hydroaromatic compounds; Benzene-nuclei linked together directly or indirectly by carbon; Condensed benzene-nuclei; Nuclei containing nitrogen, Oxygen and sulphur; Condensation-products of benzene and heterocyclic nuclei; Alkaloids.

HOLLEY, C. D. Analysis of Paint and Varnish Products 292 p. 8 vo. il. 1912. $2.50

CONTENTS: Separation of vehicle from pigment. Estimation of water in paints. Water emulsions Estimation of and determination of purity of linseed oil Analysis of the volatile oils. Turpentine thinners and substitutes Inert pigments. White lead and zinc pigments. Determination of fineness, covering power and tinting strength of pigments Testing-out of paints. Analysis of white paints. Kalsomine, cold water paints and flat wall finishes. Composition and analysis of colored paints. Fillers. Shingle stain, barn and roof paints. Japans and driers. Shellac. Spirit and oil varnishes. Enamels

HOLLEY, CLIFFORD DYER. Analysis of Paint Vehicles Japans and Varnishes. 203 p. 8 vo. il. 1920. $2.50

The methods of analysis are essentially those used by the author in his laboratory work, many of them the result of extended investigation by him and his associates. The book should be of material aid to all engaged in the manufacture and examination of paint, enamel and varnish products.

Contents: Examination of petroleum thinners; Examination of turpentine; Alcohols and acetones; Benzol and solvent naphthas; Linseed oil; Tung oil (Chinese wood oil); Miscellaneous paint and varnish oil; Separation of vehicle from pigment, Estimation of water in paints; Water emulsions and emulsifiers, Determination of volatile thinner; Examination of extracted oil, Effect of storage on the composition of paints, Analysis of solid and liquid driers; Comparative analysis of black baking japans, Analysis of shellac and lacquers, Analysis of varnish and enamel liquids Addenda Index

HOOD, CHRISTOPHER. Iron and Steel: Their Production and Manufacture. (Pitman's Common Commodities and Industries.) 150 p. 12 mo. il 1919 **$1.00**

Contents Iron ores, Coke and limestone, The history of iron making; Origins and progress, The history of modern steel processes, The Bessemer process, The Siemens Martin open hearth process, The electric furnace, The processes and plant used in iron and steel making The blast furnace and its accessories, Steel furnaces and processes, The acid open hearth; Foundry iron, The history of the trade in iron, The iron trade in various countries, The warrant market, Protective policies and combinations of manufacturers

HOOL, G. Alb., and others. Concrete Engineers' Handbook, data for the design and construction of plain and reinforced concrete structures 885 p 8 vo il. 1918 **$6.00**

Contents: I—Materials II—General methods of construction III—Construction plant IV—Concrete floors and floor surfaces, sidewalks and roadways V—Properties of cement, mortar and plain concrete VI—General properties of reinforced concrete VII—Beams and slabs VIII—Columns IX—Bending and direct stress. X—Moments in rigid building frames XI—Buildings XII—Foundations XIII—Retaining walls XIV—Slab and girder bridges XV—Concrete floors and abutments for steel bridges XVI Arches XVII—Hydraulic structures XVIII—Miscellaneous structures XIX—Estimating Appendices: A—Standard specifications and tests for Portland cement. B—Working stresses C—Rulings pertaining to flat-slab design D—Standard notation

HOOL, GEORGE A., and JOHNSON, NATHAN C. Handbook of Building Construction. Two volumes (not sold separately). 1474 p. 8 vo, flexible, il. 1920. Per set, **$10.00**

Modern reference data for architects, designing and constructing engineers and contractors The book covers thoroughly the design and construction of the principal kinds and types of buildings with their mechanical and electrical equipment Every detail of practical construction is considered This handbook is complete and thorough in every detail

Contents Part I—Design and Construction I Elements of structural theory II Designing and detailing of structural members and connections III Structural data IV General designing data V. Construction methods VI Construction equipment VII Building materials Part II—Estimating and Contracting I Estimating steel buildings II Estimating concrete buildings III Architectural practice IV Contracts V. Specifications Part III—Mechanical and Electrical Equipment. I Heating, ventilation and power II Water supply data and equipment. III. Sewage disposal IV Waterless toilet conveniences. V Plumbing and drainage VI Electrical equipment VII Electric lighting and illumination VIII Gas lighting IX. Gas fitting X Elevators XI. Mechanical refrigeration XII Communicating systems. XIII. Lighting protection XIV Vacuum cleaning equipment

HOOPER, LUTHER. Silk: Its Production and Manufacture. (Pitman's Common Commodities and Industries) 144 p. il 12 mo. 1920 **$1.00**

Contents The value of silk, and source of supply, The silk worm, Varieties of silk producing moths, History of silk and sericulture, The practice of sericulture, Reeling from the cocoons, Silk throwing and winding; Silk dyeing, Varieties of silk thread, Ancient silk weaving, The ornamental silk webs of China, The simple and compound draw loom for silk weaving, Satin damask weaving; Silk weaving in the East, A. D. 1200; The introduction of silk weaving into Europe, Development of European silk weaving, thirteenth to sixteenth century, English silk weaving to about 1800, Modern silk weaving

HOOVER, T. J. Concentrating Ores by Flotation. 320 p 8 vo. 1916. **$3.75**

HOPKINS, A. A., Editor. Scientific American Cyclopedia of Formulas. 1000 p. 8 vo. il. 1911. **$5.00**

HOPKINS, NEVIL M. Outlook for Research and Invention. 241 p. 12 mo. il. 1919. **$2.00**

HORWOOD, C. B. Gold Deposits of the Rand. 436 p. 8 vo. 1917. **$6.00**

HOVESTADT, H. Jena Glass. Translated and Edited by J. W. Everett. 419 p. 8 vo. 1902. **$7.20**

Contents: Optical properties of glass, The perfecting of optical systems by new glasses, The microscope, Photographic optics, The telescope, The mechanical properties of glass, Thermal properties of glass; After-working and thermometry; Chemical behavior of glass surfaces; Electrical and magneto-optic properties of glass

HOWE, HARRISON E. The New Stone Age. 400 p 8 vo. il. 1921. **$3.00**

Contents: Raw materials and processes of manufacture, By-products in the cement industry; Theory of Portland cement setting, Other types of cement, Concrete, Reinforcement, Some factors influencing permanence, Some phases of cement and concrete testing, Art in cement and concrete, Applying cement mortar, Highways, Concrete in railroading; Bridges; Concrete in waterways; Concrete ships, Building for a thousand years; Waterproofing and surface protection, Concrete tanks; Concrete products; Concrete on the farm; Military and miscellaneous uses

HOWE, HENRY MARION. The Metallography of Steel and Cast Iron. 641 p. 4 to. il. 1916. **$10.00**

This quarto volume of over 600 pages by one of the best known of American metallurgists "consists of two distinct parts, an introduction to the new science of microscopic metallography, as applied to steel and to cast iron, and an extended study of the very new branch of that science, the mechanism of plastic deformation"—subjects, the application of which forms the basis for the great advances to be expected in the metallurgy of iron and steel. There are many reading references and carefully prepared drawings, including excellent photomicrographs.

HOWE, I. ALLEN. Stone and Quarries. (Pitman's Common Commodities and Industries. 137 p il. 12 mo. 1920. **$1.00**

Contents The stone industry; Rocks, stones and minerals; Classification of stones; Types of stone and their modes of occurrence; Limestones; Sandstones, Slate, Marble, Granites, Other igneous rocks; Employment of stone, Building and engineering, Roads and paving; Decoration and sculpture, Miscellaneous uses of stone, Quarrying; The preparation of stone for the market Appendix List of Books.

HOYT, S. L. Metallography. Part One—Principles. 256 p. 8 vo. il 1920. **$3.00**

Contents Constitution diagrams, Preparation of metallic alloys, Metallic microscopy, Microstructure of metals and alloys, Pyrometry and thermal analysis, Physical properties, Mechanical properties

Part Two—The Metals and Common Alloys. 462 p. 8 vo. il. 1921. **$5.00**

Contents The pure metals, White metal alloys, Light metal alloys, Brasses and bronzes, Steel and cast iron, Special steels

Part Three—on Technical Practice, is in preparation.

HUBBARD, E. The Utilization of Wood Waste. Third edition Translated from the German of the second revised and enlarged edition by M. J Salter 208 p 16 mo. il. **$4.50**

Contents. Utilization of sawdust, Employment of sawdust as fuel, with and without simultaneous recovery of charcoal and the products of distillation, Manufacture of oxalic acid from sawdust; Manufacture of spirit (ethyl alcohol) from wood waste; Patent dyes (organic sulphides, sulphur dyes or mercapto dyes); Artificial wood and plastic compositions from sawdust production of artificial wood compositions for moulded decorations, Employment of sawdust for blasting powders and gunpowders, Employment of sawdust for briquettes, Employment of sawdust in the ceramic industry and as an addition to mortar, Manufacture of paper pulp from wood, Various applications of sawdust and wood refuse; The production of wood wool.

HUBBARD, PREVOST. Laboratory Manual of Bituminous Materials; for the use of students in highway engineering. 153 p. 8 vo. il. 1916. **$1.50**

A complete practical guide for the student or highway engineer who has a laboratory at his disposal and who desires not only to make the more common and widely used tests with a reasonable degree of accuracy, but to interpret the results as well. Part 1 defines and classifies the various bituminous materials, describes the processes of refining, and gives information concerning laboratory equipment Author is a lecturer in Columbia University, and Chief of the Division of Road Material Tests in the United States Government Office of Public Roads.

HUDDERS, E. R. Indexing and Filing. 304 p. 12 mo. 1918. **$3.00**

HUDSON, O. F. Iron and Steel. An introductory text-book for engineers and metallurgists. With a section on Corrosion by Guy D. Bengough. 184 p. 8 vo il **$3.00**

Contents. Mechanical testing Smelting of iron ores Properties of cast iron. Foundry practice. Mixing cast iron for foundry work. Malleable cast iron Wrought iron. Manufacture of Steel Cementation process. Crucible steel. Bessemer process Open hearth process Electric furnaces. Mechanical treatment of steel Reheating Impurities in steel Constitution of iron carbon alloys. Heat treatment of steel Special steels. Steel castings Case hardening. Welding The corrosion of steel and iron.

HUEBNER, JULIUS. Bleaching and Dyeing of Vegetable Fibrous Materials. 457 p. 8 vo 1912. **$7.50**

Contents The vegetable fibres Water Chemical and mordants. Bleaching Mercerising Mineral colours The natural colouring matters Basic cotton dyestuffs Substantive cotton dyestuffs Sulphur dyestuffs. Acid and resorcine dyestuffs Insoluble azo colours, produced on the fibre. The vat dyestuffs Mordant dyestuffs Colours produced on the fibre by oxidation. Dyeing machinery. Estimation of the value of dyestuffs. Appendix

HULTGREN, AXEL A. Metallographic Study on Tungsten Steels. 95 p. 8 vo. 5 diagrams, 76 photo micrographs. 1920. **$3.00**

Translation of a Swedish paper, combined with critical reviews of later published results by other investigators The studies on which the author's theories are based were undertaken in the Institute of Technology, Charlottenburg The author's work in harmonizing conflicting data and views constitutes a step forward in the field of tungsten steel

Contents: Part I—The Transformation of Tungsten Steels During Different Heat Treatments and the Structures Thereby Formed Previous investigations; Composition, Experimental methods, The experiments and their results, The stability of the austenite, Pearlite transformation, Secondary ferrite discussion of the results obtained; Critical discussion of previous investigations Part II Carbides in Tungsten Steels. Previous investigations; The author's investigations; Preliminary discussion, Carburization experiments, Welding experiments; Iron tungsten-carbon alloys, Partial melting of tungsten steels; Separation and analyzing of the X carbide; Review of carbides and similar constituents found in microscopic investigation of iron tungsten carbon alloys, Tentative iron tungsten-carbon diagram; Criticism of previous investigations; Some practical consequences of free carbides in tungsten steels. Supplement Concerning Carbides in Other Alloy Steels Appendix. Investigations on tungsten steels by Honda and Murakami

HUMPHREY, J. Drugs in Commerce. (Pitman's Common Commodities and Industries.) 113 p. il 12 mo 1921. **$1.00**

Contents: Drugs in commerce, etc; Acacia bark, etc, Camphor and camphor oil, etc.; Coca leaves and cocaine, etc, Grindelia, etc; Nutmegs and nutmeg oils, etc, Sassafras root, etc

HUNTER, J. A. Wool; from the raw material to the finished product. 118 p. 12 mo. 1912. **$1.00**

HUNTINGTON, E. VERMILYE. Handbook of Mathematics for Engineers. Reprint of the sections 1 and 2 of Marks' Mechanical Engineers' Handbook. 191 p. 12 mo. 1918. **$2.00**

HUNZIKER, OTTO F. The Butter Industry. 710 p. 8 vo. il. 1920. **$5.75**

CONTENTS. History and development of butter industry; Creamery organization, construction and equipment; Buying milk and cream; Separation of milk, Receiving milk and cream; Neutralization of sour cream; Pasteurization; Cream ripening and starters, Churning, Washing, salting and working, Packing butter; The overrun, Markets and marketing, Butter storage, Butter scoring; Butter defects, Composition and properties of butter, milk, cream, skim milk and buttermilk, Healthfulness, food value and biological properties, Definitions and standards; Whey butter, renovated butter and ladles, Standardization, tests and chemical analyses of milk, cream, skim milk, buttermilk and butter

HURLBURT, E. N. Tycos Gravity and Temperature Tables for Mineral Oils. 204 p. 12 mo. 1918. **$1.00**

HURST, GEORGE H. Dictionary of Chemicals and Raw Materials Used in the Manufacture of Paints, Colours, Varnishes and Allied Materials. 370 p. 8 vo 1917. **$5.00**

HURST, GEORGE H. A Manual of Painters' Colours, Oils and Varnishes. Revised by Noel Heaton, B.Sc., F.C.S. With a chapter on Varnishes by M. B. Blackler, Ph.D. Fifth edition, revised and enlarged 528 p 8 vo il 1913. **$4.50**

CONTENTS Introductory The properties of pigments in general white pigments— The lead and zinc whites Mineral whites Red pigments Orange and yellow pigments. Green pigments Blue pigments. Brown pigments. Black pigments. Organic pigments and lakes. Oils and solvents, gums, glues, and resins Varnishes Paint Appendix A. Appendix B Index.

HURST, GEORGE H. Soaps. A Practical Manual of the Manufacture of Domestic, Toilet and Other Soaps. Second edition. 385 p. 8 vo. il. 1907. **$6.00**

CONTENTS: Soap Makers' Alkalies; Soap Fats and Oils; Perfumes, Water as a Soap Material, Soap Machinery; Technology of Soap Making, Glycerine in Soap lyes; Laying Out a Soap Factory, Soap Analysis

HURST, GEORGE H., and SIMMONS, W. H. Textile Soaps and Oils. A handbook on the preparation, properties, and analyses of the soaps and oils used in textile manufacturing, dyeing and printing. Third edition, revised and partly rewritten. 204 p. 8 vo. il. 1921. **$4.00**

CONTENTS: *Textile soaps.* Introductory; Methods of making soaps; Special textile soaps, Relation of soap to water for industrial purposes; Treating waste soap liquors; Soap analysis. *Animal and vegetable oils and fats* Tallow, lard, bone grease, tallow oil, lard oil, whale oil or train oil, Paul oil, palm nut or palm kernel oil, cocoa nut oil, olive oil, arachis oil, cotton seed oil, soya bean oil, linseed oil, castor oil, maize (corn) oil, rape oil. *Glycerine. Textile oils* Wool oils, oleines, wool oils, oleic acid, blended wood oils, oils for cotton dyeing, printing and finishing, color oil, turkey red oils, turkey red oil, alizarine oil oleine, oxy turkey-red oils, soluble oil, analysis of turkey red oil; finishers' soluble oil, finishers' soap softenings, oil and fat analysis.

HUTSON, A. C. Fire Prevention and Protection; a compilation of insurance regulations covering modern restrictions on hazards. Third edition. 778 p. 12 mo il. 1918 **$4.25**

Has chapters on explosives, pyroxylin plastic, inflammable liquids, gases and vapors, etc.

HYDE, FREDERIC S. Solvents, Oils, Gums, Waxes and Allied Substances. 182 p. 8 vo. **$2.00**

These notes are intended for the use of factory chemists and others who may desire a short reference book on commercial organic products.

CONTENTS: Various solvents and fluids. Camphors, essential oils and balsams. True gums, gum resins and bituments. Carbohydrates, albuminoids and proteids. Oils and fats. Comparisons of oils and fats Linseed oil Insoluble soaps Fatty acids Waxes. Alkaloidal substances Bitter principles. Miscellaneous substances.

IBBETSON, A. Tea: From Grower to Consumer. (Pitman's Common Commodities and Industries.) 114 p il 12 mo. 1920. **$1.00**

CONTENTS Description of tea plant, Large consumers, Chemical analysis, Various methods of cultivation and manufacturing, Tea in India and other countries, Modern methods of cultivation and manufacturing, Taxation of tea, Public sales, Sampling and buying; Discriminating tasting, Blending, packing and storing, How to create interest in finer tea, Fine tea sold at Mincing Lane

IBBOTSON, F., and AITCHISON, L. The Analysis of Non-Ferrous Alloys. By Fred. Ibbotson, B.Sc., B. Met., A.R.C.Sc.I.; and Leslie Aitchison. 238 p. 8 vo. 1915. **$2.75**

IDDINGS, J. P. Rock Minerals; their chemical and physical characters and their determination in thin sections. 617 p 8 vo. 1911. **$6.00**

INGLE, HARRY. A Manual of Oils, Resins, and Paints; for students and practical men. In three volumes. Vol. I Analysis and Valuation. 248 p. 12 mo. il. 1915. **$2.00**

This volume is for practical paint workers and for all those interested in applied industrial chemistry. Each volume in this great series is to be complete in itself,—this one gives a thorough tabulated account of the methods of analysis and evaluation

CONTENTS: Introduction. Introduction to the chemistry of oils. Physical tests Chemical tests Qualitative tests for oils The classification of oils. The systematic examination of oils, fats and waxes. Technological analysis. Table of oil constants. Index.

INGLE, H. Manual of Agricultural Chemistry. Fourth Edition. 12 mo. 1920. **$5.00**

CONTENTS: The Atmosphere; Soil; Reactions Occurring in Soils; Analysis of Soils; Manures; Analysis of Manures; Constituents of Plants, The Plant; Crops; The Animal; Foods and Feeding; Milk and Milk Products; Analysis of Milk; Miscellaneous Products Used in Agriculture.

INGALLS, W. R. Lead and Zinc in the United States. By Walter Renton Ingalls, Editor of the Engineering and Mining Journal. 370 p. 8 vo. il. 1908. **$4.00**

In this book Mr. Ingalls has presented the results of a study of the lead and zinc industries in the United States, covering the mining and metallurgy of the two metals, and all phases of the industries The book is indeed a history of these industries in the United States, but it is a history purely from the economic standpoint.

INGALLS, W. R. Lead Smelting and Refining. Edited by Walter Renton Ingalls. 327 p. 8 vo. 1906. **$3.00**

A compilation of the best contributions by leading authorities to the Engineering and Mining Journal.

CONTENTS: Notes on lead mining. Roast-reaction smelting. Sintering and briquetting Smelting in the blast furnace Lime roasting of galena Other methods of smelting. Dust and fume recovery. Blowers and blowing engines. Lead refining. Smelting works and refineries.

INGALLS, W. R. (Editor). Notes on Metallurgical Mill Construction. Edited by Walter Renton Ingalls. 256 p. 8 vo 1906. **$2.00**

A full discussion by leading authorities of the engineering problems connected with metallurgy

CONTENTS Part I - Brickwork and concrete. II.—Building construction III.—Ore crushing machinery. IV —Driers and drying V – Conveyors and elevators. VI —Disposal of tailings. VII.—Miscellaneous.

INGALLS, W. R. Metallurgy of Zinc and Cadmium. By Walter Renton Ingalls. Second edition. 701 p. 8 vo. 1906 **$7.00**

CONTENTS: Zinc and ores. Calcination and calamine. Blende roasting Roasting furnaces Utilization of the sulphurous gases. General principles of zinc distillation. Retort and condenser manufacture Fuel and systems of combustion. Chimneys, heat recuperation and furnace design, Distillation furnaces. Practice in distillation Losses in distillation Refining impure zinc and composition of commercial spelter. Cadmium and its recovery. Cost of producing zinc Design and construction of smelting works. Examples from practice. Proposals to smelt zinc ore in the blast furnace Manufacture of zinc dust, zinc white, zinc sulphate and zinc chloride.

INNES, C. H. Centrifugal Pumps, Turbines and Water Motors. Fifth edition. 350 p. 12 mo. il. 1909. **$3.00**

CONTENTS Motion of water under pressure; Measurement of power; Energy of rising and falling water; Friction in piping, Loss of energy, Hydraulic engines; The turbine; Suction tube; Turbine governors; Various water wheels; The steam turbine, Centrifugal pump, Fan, Hydraulic works at Niagara Falls; Hydraulic buffers.

INNES, C. H. The Fan: Including the Theory and Practice of Centrifugal and Axial Fans. 258 p. 12 mo. il. 1904. **$4.00**

CONTENTS: Conservation of energy; Losses of head; Manometer, anemometer and pilot tube; Calculation of density of air; Change of moment of momentum, Theoretical characteristics; Design of fans; Variation of pressure in centrifugal fans; Various tests on fans; Comparison between theory and experiment; High pressure fans; Theory of propeller ventilating fans; Experiments; Types of propeller ventilating fan.

IVENS, EDMUND M. Pumping by Compressed Air. Second edition, revised and enlarged. 266 p 124 il 8 vo. 1920. **$4.00**

Some thirty pages of text and eighteen illustrations, together with several formulas and tables, have been added This book now contains all the information that is necessary for the intelligent study, design, installation, and operation of a compressed air pumping plant of any size or capacity

CONTENTS Pumping water by direct action through pistons, The displacement pump; Return air system; The air lift, Submergence; Velocities, Central pipe systems (open end and perforated end); Commercial systems—the Bacon system, the Harris system, the Weber system, Compression generalities; The air card and air compressor efficiency; The compressor, Flow of compressed air in pipes, Flow of water in pipes, A properly designed installation—the water pumps, the sewerage pumps, the wells, Operation curves Index.

JACKSON, PERCY G. Boiler Feed Water. A Concise Handbook of Water for Boiler Feeding Purposes. 102 p. 12 mo. 1920. **$2.00**

JACOUTET, AUGUST. Chocolate and Confectionery Manufacture. 226 p. 8 vo. 1917. **$7.50**

JEANS, J. D. The Dynamical Theory of Gases. Third edition. 442 p 1921. **$10.00**

In this edition the author gives greater prominence to the Quantum Theory by adding a chapter on Quantum Dynamics, dealing mainly with the quite recent works of Ehrenfest, Sommerfeld, Epstein and others, necessarily a very brief introductory of the mysteries of the subject, but a stimulus to English readers of this branch of science, of which development has, so far, been left mainly to other nations.

JEHL, F. The Manufacture of Carbons for Electric Lighting and Other Purposes. 232 p. 8 vo. il. 1915. **$5.00**

CONTENTS: Physical Properties of Carbon; Historical Notes; Facts Concerning Carbon; Modern Process of Carbon Manufacture; A "New" Raw Material; Gas Generators; Furnace; Estimation of High Temperatures; Gas Analysis; Building a Carbon Factory; Capital Necessary; Soot or Lampblack; Soot Factories; American Methods of Manufacture.

JENNINGS, ARTHUR S. Commercial Paints and Painting. 224 p. 8 vo. 1914. **$2.00**

CONTENTS: Object of painting; Durability of paint; Cost of cheap and superior paints compared; Cost of keeping property painted; Specifying paints; The materials used in painting; Conditions which determine the economic value of the paint; Simple tests for painters' materials; The paint most suitable for different surfaces; How paint and varnish should be applied; Paint and color mixing; Tools and plant; Defects in painters' work; Specifications for painters' and decorators' work; Painting by mechanical means.

JENNINGS, ARTHUR SEYMOUR. Painting by Immersion and by Compressed Air. A practical handbook. 272 p. 8 vo. il. 1915. **$3.50**

A well illustrated work describing in detail the principal appliances (with makers' names and addresses) for spraying, dipping, and "flowing-on" of paint, lacquer, varnish and similar liquids. Cites 250 products to which the operations may be applied.

"There is abundant evidence to prove that the application of paint, either by means of dipping, spraying or other mechanical means, effects an enormous saving of time over the old method of using brushes, while the coats of paint are more durable and thorough. This saving of time not only lowers the cost of production to a very considerable extent, but it permits of a large increase in the output."—*Preface*

JENNINGS, ARTHUR S. Paint and Color Mixing. A practical handbook for painters, decorators, paint manufacturers, artists, and all who have to mix colors. Containing over 300 samples of actual oil- and water paints and water colors of various colors, and upwards of 1,500 different color mixtures. 245 p. 8 vo. il. 1915. **$2.50**

The fifth edition of this practical work (first published in 1902) represents thorough revision and important additions, including new chapters on mixing and matching colors, straining colors, putty hard stopping, knife and brush filling, two hundred standardized colors, and color nomenclature.

JENNINGS, A. S. Paints and Varnishes. (Pitman's Common Commodities and Industries.) 108 p. il. 12 mo. 1920. **$1.00**

CONTENTS: The characteristics of a good paint, The principal pigments used in paint making, The thinners used in paint, Paint mixing, the application of paints, etc., Whitewashes and distempers, Service tests of paints and varnishes, Machinery used in paint making, Varnishes and enamels, Tables, etc.

JOBLING, E. Catalysis and Its Industrial Applications. Second edition. 152 p. 12 mo. 1920. **$2.25**

JOHANNSEN, A. Manual of Petrographic Methods. By Albert Johannsen, Ph D., Associate Professor of Petrology, The University of Chicago. Second edition. 640 p. 8 vo. il. 1918. **$7.00**

A more complete work than has ever appeared in English on modern petrographic-microscopic methods. It is based on exhaustive search of the foreign publications and original investigations.

CONTENTS: I.—Mineralogical principles. II.—Stereographic projection. III.—A few principles of optics. IV.—Isotropic media. V. and VI.—Anistropic media. VII.—Lenses. VIII., IX. and X.—The microscope. XI.—Various modern microscopes. XII.—Selecting, using and taking care of a microscope. XIII., XIV. and XV.—Observation by ordinary light. XVI.—Measurements under the microscope. XVII.—Drawing apparatus. XVIII.—Rotation apparatus. XIX.—The color of minerals. XX.—Monochromatic light. XXI.—Examination by plane polarized light. XXII.—Interference colors. XXIII. to XXVIII.—Examination between crossed nicols. XXIX. and XXX.—Observations by convergent polarized light. XXXI.—Dispersion of light in crystals. XXXII.—The petrographic microscope as a conoscope, and the methods of observing interference figures. XXXIII.—Determination of the optical character of a crystal by means of its interference figure. XXXIV.—Measurement of the optical axial angle by convergent polarized light. XXXV.—Measurement of the optic axial angle by means of a rotation apparatus. XXXVI.—Determination of other properties than V by means of the universal stage. XXXVII.—Optical anomalies. XXXVIII.—Determination of specific gravity. XXXIX.—The mechanical separation of rock constituents. XL.—Micro chemical reactions. XLI.—Preparation of thin sections of rock. XLII.—Petrographic collections. APPENDIX.

JOHNSON, A. E. The Analyst's Laboratory Companion. By Alfred E. Johnson, B.Sc., London. F.I.C., A.B.R.Sc.I. Fourth edition, enlarged. 12 mo. 1912. **$2.00**

A collection of tables and data, together with numerous examples of chemical calculations and concise descriptions of several analytical processes for the use of analysts, agricultural, brewers, and industrial chemists and stduments.

JOHNSON, CHARLES MORRIS. Rapid Methods for the Chemical Analysis of Special Steels, Steel-Making Alloys and Graphite. Third edition, revised. 552 p. 8 vo. 70 il. 1920. **$6.00**

An unusually thorough revision, including all of the important new metals as well as new methods for the analysis of older ones. Anyone who knows general chemistry can follow the author's instructions and get real results.

JOHNSON, JOSEPH B. Materials of Construction. Fifth edition, rewritten by M. O. Withey and James Aston. Edited by F. E. Turneaure. 840 p. 8 vo. il. 1919. **$6.00**

CONTENTS: Synopsis of the principles of mechanics of materials; Machines and appliances for mechanical tests; The mechanical testing of structural materials; Characteristics, physical properties, and uses of wood; The deterioration and preservation of timber; Building stone; Structural clay products; Portland cement; Natural and other hydraulic cements; Limes and plasters; Methods of testing hydraulic cements; Making mortar and concrete; The physical properties of mortar and concrete; Portland cement products; Metals and their ores; Reduction of iron from its ores; Manufacture of wrought iron and steel; The manufacture of iron and steel shapes; Formation and structure of alloys; Constitution of iron and steel; Properties of wrought iron; Properties of steel; Alloy steels; Cast iron and malleable cast iron; Nonferrous metals and alloys; The effect of temperature on the mechanical properties of metals; Fatigue of metals; The corrosion of metals.

JOHNSON, JOSEPH ESREY. Blast-furnace Construction in America. 415 p. 8 vo. il. 1917. **$5.00**

This comprehensive work, based partly upon investigations by the author, fills a long felt want in metallurgical literature. Enough of recent history is given to show the present trends of the art. Describes the handling of the raw materials, filling the furnace, the equipment of the boiler plant, blowing apparatus, hot blast stoves, stacks, cleaning and washing of the gas, handling the iron and cinder, auxiliaries, and general arrangement of the plant. Of special note is the chapter on the dry blast.

JOHNSON, JOSEPH E. Principles, Operation and Products of the Blast Furnace. 553 p. 8 vo. 1918. **$6.00**

"A thoroughly detailed discussion of the operation of the blast furnace."

JOHNSON, ROSWELL H., and HUNTLEY, L. G. Principles of Oil and Gas Production. 371 p. 8 vo. il. 1916. **$4.50**

A general treatise on the production of oil and gas with reference to American conditions.

CONTENTS: Varieties of oil and gas. Origin of oil and gas. Reservoirs of oil and gas. Accumulation of oil and gas. Pressure in oil and gas reservoirs. Origin of the shape of reservoirs. Classification of the attitude of reservoirs. Application of the different attitudes to accumulation. Locating oil and gas wells. Oil and gas lands. Oil and gas well drilling. "Bringing in a well." Management of oil wells. Completing the extraction of the oil. Management of gas wells. Condensation of gasoline from gas. Reports upon oil and gas prospects or upon an oil property. The valuation of oil and gas properties. Oil market and the future supply.

JOHNSON, W. H. Cultivation and Preparation of Para Rubber. 186 p. 8 vo. 1909. **$3.00**

JOHNSTON, J. F. W., and CAMERON, CHAS. Elements of Agricultural Chemistry. Twenty first edition. 502 p. 8 vo. il. 1912. **$2.60**

CONTENTS: Chemical Nomenclature, Constituents of Plants and Animals, Composition of the Atmosphere, Growth of Plants, Soils; Rocks, Improvement of Soils, Lime, Irrigation, Exhaustion of Soils; Germination of Seeds, Assimilation by Plants, Manures, Manuring; Animal Nutrition, Vegetable Foods; Fodder Crops, Seed Furnishing Crops, Roots and Tubers, Milk, Butter, Cheese, Food Rations.

JOHNSTONE, S. J. Rare Earth Industry; including the manufacture of incandescent mantles, pyrophoric alloys and electrical glow lamps. 136 p. 8 vo. 1915. **$4.00**

JONES, E. GABRIEL. Chemistry for Public Health Students. 244 p. 8 vo. 1919. **$2.50**

CONTENTS: Use of balance, Volumetric analysis; Milk; Butter and margarine, Alcoholic beverages; Various foods, their composition and adulteration with some details of the methods of analysis; Methods of preserving foods, Water, Sewage effluents, Air, Disinfectants; Preparation of solutions.

JONES, E. H. Smelter Construction Costs. Unit construction costs from the smelter of the Arizona Copper Co., Ltd. By E. Horton Jones. 152 p. 8 vo. il. 1914. **$2.00**

Republished by special arrangement with the American Institute of Mining Engineers. Smelter construction costs, in the fullest detail, are given in this book. The data are based on construction of the Arizona Copper Company's new smelters at Clifton, Arizona, completed February, 1914.

JONES, FRANKLIN DAY. Mechanisms and Mechanical Movements; a treatise on different types of mechanisms and various methods of transmitting, controlling and modifying motion, to secure changes of velocity, direction, and duration or time of action. 310 p. 8 vo. il. 1918. **$2.50**

JONES, HARRY C. The Electrical Nature of Matter and Radioactivity. Third edition, revised. 220 p. 8 vo. 1915. **$2.25**

(Author was professor of physical chemistry at Johns Hopkins University.)

CONTENTS: The electrical conductivity of gases; The determination of the mass of the negative ion in gases; Nature of the corpuscle; The electrical theory of matter, The nature of the atom in terms of the electron theory, The X rays, The discovery of radium; Other radioactive substances in pitchblende, The Alpha rays, The Beta and Gamma rays, Other properties of the radiations, Production of heat by radium salts; Emanation from radioactive substances, Helium produced from the emanation, Induced radioactivity, Production of radioactive matter, Theoretical considerations, Wide distribution of radioactive matter and the origin of radium.

JONES, H. C. The Elements of Physical Chemistry. By the late H. C. Jones. Fourth edition, revised and enlarged. 650 p. 8 vo. 1915. **$4.75**

Considerable new matter has been incorporated in this latest edition, the matter, for the most part, being inserted at the ends of the chapters.

JONES, HARRY C. "The Freezing-Point, Boiling-Point, and Conductivity Methods. Second edition, 76 p. 1912. **$1.25**

CONTENTS: The freezing point method, Theoretical discussion; The application of the freezing point method to the determination of molecular weights in solution. The application of the freezing point method to the measurement of electrolytic dissociation, The boiling point method; Theoretical discussion; The application of the boiling point method to the determination of molecular weights in solution, Results for a few substances, The application of the boiling point method to the measurement of electrolytic dissociation, The conductivity method; The application of the conductivity method to the measurement of electrolytic dissociation.

JONES, HARRY C. The Nature of Solution., With a biographical memoir by Prof. E. Emmet Reid and tributes by Professors Arrhenius, Ostwald and Woodward. 406 p. 8 vo. 1917. **$3.75**

CONTENTS: Importance of solution; Earlier views as to the nature of solution; The osmotic pressure of solutions, Relations between solutions and gases demonstrated by Vant Hoff; The theory of electrolytic dissociation as announced by Arrhenius, Diffusion in solution; Depression of the vapor tension of a solvent by substances dissolved in it, Depression of freezing point of a solvent by the solute; Aqueous solutions of acids, bases and salts. electrolytes, Some electrical properties of aqueous solutions of electrolytes; Solution in nonaqueous and in mixed solvents; Colloidal solutions, Solutions in solids as solvents; The newer hydrate theory, The solvate theory of solutions.

No subject in chemistry has received more attention, especially during the last quarter of a century, than that of solution. This is due primarily to the fundamental significance of solution for chemical science. Solutions in the broad sense of the term are fundamental not only for chemistry, but for geology and the various branches of biology.

JONES, HARRY C. New Era in Chemistry. 336 p. 12 mo. 1913. $2.00

An exposition of the difference between the chemistry of to-day and that of twenty-five years ago, showing in what this difference consists, how these new developments were brought about and by whom. The author writes with authority, having known well the men who were instrumental in bringing about this "New Era"

JONES, M. W. The Testing and Valuation of Raw Materials Used in Paint and Color Manufacture. 88 p. 12 mo. 1900 $2.50

Contents Compounds of: aluminum; iron, potassium, chromium; tin; copper, lead, zinc, arsenic; antimony, calcium, barium, cadmium, mercury, cobalt carbon; china clay, ultramarine, oils

JORGENSEN, ALFRED. Micro-organisms and Fermentation. Fourth edition, completely revised. Translated by S. H. Davis, M Sc. 489 p. 8 vo. il. 1911. $6.00

A textbook written by one of the foremost exponents of the honored Danish School of Micro-Biological Research, and by a pioneer of world wide reputation in the industrial application of selected types of yeast

In comparison with the enormous output of works on the organisms of disease, little has yet been published in English on the technical application of micro-biology This book covers ground which is not fully surveyed in any existing treatise The necessity of embodying the results of ten years' research has led to such a mass of additions and alterations in the last English edition that this must be regarded as a new work It is based on the fifth German edition

Contents: Microscopical and physiological examination Biological examination of air and water, bacteria, moulds, yeasts. The pure culture of yeast on a large scale. Bibliography. Index.

JUEPTNER, H. von. Heat Energy and Fuels. Pyrometry, combustion analysis of fuels and manufacture of charcoal, coke and fuel gases By Hanns von Jueptner, translated by Oscar Nagel, Ph.D 306 p. 8 vo. il 1908. $3.00

General Remarks Forms of energy. The measurement of high temperatures (pyrometry). Optical methods of measuring temperatures. Combustion heat and its determination. Direct methods for determining the combustion heat. Incomplete combustion Combustion temperature Fuels (in general) Wood Fossil solid fuels (in general). Peat Brown coal (lignite). Bituminous and anthracite coals. Artificial solid fuels Charcoal. Peat coal Coke and briquettes. Coking apparatus. Liquid fuels. Gaseous fuels. Producer gas. Water gas. Dowson gas, blast furnace gas and regenerated combustion gases. Apparatus for the production of fuel gases.

JUEPTNER, H. von. Siderology: The Science of Iron. (The Constitution of Iron Alloys and Iron.) Translated from the German by Charles Salter. 352 p. 8 vo il. $5.00

Contents: Introduction, The Theory of Solution, Micrography, Chemical Composition of the Alloys of Iron; Chemical Composition of Slag

JULIAN, H. FORBES and SMART, EDGAR. Cyaniding Gold and Silver Ores. Second edition. 484 p. 8 vo. il. 1907 $7.00

Contents: Early history of the cyanide process. Preliminary investigations. Crushing to cyanide. Weighing and measuring. Percolation and leaching. Principles involved in the dissolution and precipitation of metals Dissolution of the gold and silver. Temperature effects. Dissolution of gold physically considered. Absorption of air by solutions. Action of various cyanide solutions Sources of loss of cyanide. Precipitation of gold and silver. Precipitation by zinc Electrical precipitation. Electrical precipitation in practice Other methods of precipitation. Cleaning up, refining and smelting Applications of the cyanide process Double treatment. Direct treatment of dry crushed ore. Crushing with cyanide solution. Slimes. Dissolving the gold and silver slimes. Theory of extraction by successive washings Treatment by agitation and natural settlement and subsequent processes Slime treatment with filter presses Design and construction of vats. Construction of other essential parts of a cyanide plant. Piping, cocks, launders, and buildings Handling materials. Ropes and gear for haulage Belt conveyors, tailings, wheels and pumps. Design and construction of spitzlutte and spitzkasten Cost of cyanide plants. Cost of treatment. Complete cyanide plants.

KAHN, MORITZ. Design and Construction of Industrial Buildings. 172 p. 8 vo. 1917. $3.00

KANSAS CITY TESTING LABORATORY. Petroleum, Asphalt and Natural Gas. 500 p. 12 mo. il. 1920. $5.00

Contents: Statistics of production and refining, Geology and economics of oil and gas, Chemical and physical properties of petroleum and its products; Specifications for petroleum products; Methods of analysis and valuation; Storage and transportation; Tank gauging and measuring; Refinery engineering; Cracking; Fuel oil; Tables; Patents; Bibliography

KANTHACK, R. Compiler. **Tables of Refractive Indices.** Vol. 1, Essential Oils. 148 p. 8 vo. 1918. $6.00

"In the present volume, the first of the series, an endeavor is made to give as complete a list as possible of this property of essential oils. The scattered literature of the subject has been carefully sifted by the compiler, and a large number of measurements have been compiled with references to the original papers This volume will serve to some extent as a bibliography of essential oils, and it may be noted that over 500 distinct oils and 1,500 measurements are recorded"

KAUTNY, T. Autogenous Welding and Cutting. By Theodore Kautny. 157 p. 12 mo. il. 1915. $1.25

A pocket book giving in compact form for ready reference such information and instruction as will help the works engineer, welder and student to a more thorough understanding of the art of autogenous welding and cutting It is an authoritative translation of a widely known German work

KAYE, G. W. C., and LABY, T. H. Tables of Physical and Chemical Constants and Some Mathematical Functions. By G. W. C. Kaye, D Sc., The National Physical Laboratory, London, and T. H. Laby, B.A., Professor of Physics, The University of Melbourne. Third edition. 160 p. 8 vo. 1921. $4.00

Prof. Laby and Dr. Kaye have attempted to collect the more reliable and recent determinations of some of the important physical and chemical constants, which will be of use to the research worker and student. Many of the tables are prefaced by a brief résumé containing references to such books and original papers as may profitably be consulted for further information. There is a copious index.

KAYE, G. W. C. X-Rays. An introduction to the study of Röntgen Rays. By G. W. C. Kaye, B.A., D.Sc., Head of the Radium Department at the National Physical Laboratory, Examiner in Medical Physics for the Universities of London and Glasgow, Member of Council of the Röntgen Society. 307 p. 8 vo. il. New edition in preparation.

KEABLE, B. B. Coffee, From Grower to Consumer. (Pitman's Common Commodities and Industries.) 122 p. il. 12 mo 1918. $1.00

Contents: Introduction, The coffee plant; Cultivation; Preparation, The principal coffee producing countries, Arabia and Abyssinia; Coffee production in the British Empire, Technical terms, Production and consumption, Preparation for the London market; Valuing, Roasting, Blending; The active principle of coffee and its medicinal properties, Coffee adulterants and substitutes, Is there any way of increasing the consumption? Coffee making, Some remarks on the duty, present and past

KEITT, T. E. Chemistry of Farm Practice. 253 p. 12 mo il. 1917. $2.00

KENDALL, E. C. Thyroxin. American Chemical Society Monograph. In preparation.

KENT, WILLIAM. Bookkeeping and Cost Accounting for Factories. 261 p. 8 vo. 1918 $4.00

KENT, W. Mechanical Engineers' Pocket Book. By William Kent, M E, Sc D Ninth edition, thoroughly revised, with the assistance of Robert Thurston Kent, M E. 1526 p. 16 mo il Flexible "Fabrikoid" binding. 1916. $7.00

A reference book of rules, tables, data, and formulas for the use of engineers, mechanics, and students. Covers the entire field of mechanical engineering, presenting the information that the engineer in practice needs in his daily work, in condensed, usable form

KERSHAW, G. BERTRAM. Modern Methods of Sewage Purification. A guide for the designing and maintenance of sewage purification works. 356 p. 8 vo. il. 1911. $7.50

This book deals with the subject of sewage purification from the engineering and practical point of view, and describes some of the more efficient methods in use at the present day, while discussing at some length the practical and financial points which require consideration Special prominence has been given to practical points which are sometimes apt to be overlooked. The book deals mainly with the problems of sewage disposal which arise in towns of moderate size.

Contents Introduction, Historical Conservancy methods, etc Drainage areas. Water supply, etc Sewage systems, etc Rainfall, storm water, etc Variations in flow of sewage, etc. Classification of sewage, etc. Considerations to be observed in selecting the site for sewage disposal works, etc Preliminary processes. Disposal of sludge. Land treatment of sewage Contact beds. Percolating filters. Trade wastes. Miscellaneous Purification works in actual operation.

KERSHAW, G. B. Sewage Purification and Disposal. By G. B. Kershaw, M.Inst.C E. 340 p. 12 mo. 1915. $3.75

KERSHAW, J. B. C. Electrometallurgy. 303 p. 8 vo. il. 1908. $2.50

Contents Aluminum, Bullion and gold, Calcium carbide and acetylene gas, Carborundum, Copper, Ferro alloys, Glass and quartz glass, Graphite iron and steel, Lead, Miscellaneous products; Nickel; Sodium, Tin, Zinc

KERSHAW, J. B. C. Electro-Thermal Methods of Iron and Steel Production. 239 p 8 vo. il. 1914. $3.00

KERSHAW, JOHN B. C. Fuel, Water and Gas Analysis For Steam Users. Second Edition, Revised and Enlarged. 213 p. 8 vo. 1920. $3.50

Contents. *Fuel* Natural and Artificial Fuels, Their Origin, Composition and Methods of Sampling, The Approximate Analysis of Fuel; Preparing the Sample, Testing the Fuel; The Calorific Valuation of Solid Fuels, The Calorific Valuation of Liquid and Gaseous Fuels; The Practical Applications of the Test Results *Water* The Sources of Feed Water Supply and the Physical and Chemical Characteristics of the Same; The Approximate Analysis of Water; The Practical Applications of the Test Results; The Use of Softening Reagents and the Tests Necessary to Regulate Their Amount *Waste Gases.* The Chemical and Physical Characteristics of the Waste Gases—Sampling the Gases, The Approximate Analysis of the Water Gases, The Use of Continuous and Recording Gas-Testing Apparatus; The Practical Applications of the Gas-Test Results; Appendix

KEYES, F. G., and BROWNLEE, R. B. Thermodynamic Properties of Ammonia; computed for the use of engineers. 73 p. 4 to. 1916. $1.00

KIDDER, FRANK EUGENE. The Architects' and Builders' Handbook. A handbook for architects, structural engineers, builders and draughtsmen, by the late Frank E. Kidder, compiled by a staff of specialists. Thomas Nolan, editor-in-chief. Seventeenth edition, revised. 1900 p. 16 mo. il. 1916. $7.00

Practically a new book—the well-known "Kidder" revised by a staff of experts headed by the professor of architectural construction in the University of Pennsylvania. There are many new illustrations and much up-to-date matter upon the subject of reinforced-concrete mill and factory construction; extended tables of specific gravities and weights of substances; data on architectural acoustics, waterproofing of foundations, the quantity system of estimating, architectural societies of the world, and extended lists of architectural schools.

KILBOURNE, C. H. Pasteurization of Milk; from the practical viewpoint. 248 p. 12 mo. il. 1916. $1.25

KING, HORACE WILLIAMS. Handbook of Hydraulics for the Solution of Hydraulic problems. 424 p. 12 mo. 1918. $3.50

A large amount of data, including 112 tables, is closely packed into this little book. It is stated that efforts have been made to simplify calculations and to secure an accuracy consistent with the best experiments. Older and commonly accepted formulas are given preference except where a gain in accuracy or simplicity or both will result from the adoption of new formulas or methods. A knowledge of the fundamental principles of hydraulics is presupposed and derivations have been largely omitted

KINGSCOTT, P. C. R., and KNIGHT, R. Methods of Quantitative Organic Analysis. 283 p 8 vo. 1914 $2.50

KINGZETT, C. P. Popular Chemical Dictionary. 368 p 8 vo. 1920. $4.00

KINNICUTT, L. P., WINSLOW, C. E. A., and PRATT, R. W. Sewage Disposal. Second edition. 547 p 8 vo il 1919. $5.00

CONTENTS. Introduction, The sanitary demand for sewage disposal; Composition of sewage, Disposal of sewage by dilution, Screening and straining of sewage; Preliminary treatment of sewage by sedimentation, Preliminary treatment of sewage by chemical precipitation, Preliminary treatment of sewage in two story tanks, Disposal of sewage by broad irrigation, or sewage farming, Disposal of sewage by intermittent filtration through sand, Treatment of sewage in contact beds, Treatment of sewage in trickling or percolating beds, Treatment of sewage by the activated sludge process, Disposal of sewage sludge, Disinfection of sewage and sewage effluents, Some general considerations in regard to the design and operation of sewage treatment plants, Disposal of sewage and excretal wastes in the absence of a sewerage system; Methods of testing sewage and sewage effluents, References

KIPPING, F. S., and PERKIN, W. H. Inorganic Chemistry. 734 p. 12 mo. 1911. $2.50

KNECHT, E., RAWSON, CHRISTOPHER, and LOEWENTHAL, RICHARD. A Manual of Dyeing. Fifth edition, thoroughly revised throughout for the use of practical dyers, manufacturers, students, and all interested in the art of dyeing. 2 volumes. Large 8 vo. 1919. Per set, $15.00

CONTENTS: Vol I Introduction Chemical technology of the textile fibers.—Vegetable fibers, animal fibers, artificial fibers Water—Physical and chemical properties. Water for technical purposes Purification of water. Washing and bleaching—Cotton Linen Hemp. Jute Wool.—Silk Tussur silk Acids, alkalies, mordants—Classification of dyers' drugs. Acids and acid mordants Bases and salts, and basic mordants. Various chemicals. Natural coloring matters—Indigo. Logwood. Fustic. Quercitron bark and flavin Weld Persian berries Young fustic. Tumeric Safflower The red woods Madder. Orchil. Cochineal Catechu. 371 p. 8 vo il

CONTENTS: Vol II—Artificial, organic coloring matters Abbreviation of names Direct cotton colors Sulphide or sulphur colors. Basic colors Eosins and rhodamines Resorcin blue Acid colors Mordant colors. Acid chrome colors. Miscellaneous colors Compounds of the aromatic series Mineral colors Chrome yellow. Orange and green Khaki. Manganese brown Iron buff and Nankin yellow. Prussian blue. Machinery used in dyeing—Dyeing of loose fiber Dyeing of tops. Foam dyeing Dyeing of yarn Dyeing of piece goods Dissolving of colors. Steaming after dyeing. Washing after dyeing. Removal of water by mechanical means Drying. Experimental dyeing and fastness of dyed colours—Experimental dyeing. Fast and loose colors. Methods of testing Analysis and valuation of materials used in dyeing Normal solutions Indicators Analysis of alkalies, acids, etc Aniline oil and aniline salts. Examination and analysis of dyes Examination of fibers, yarn, and cloth Identification of dyestuffs on the fiber. A G Green's tables for the identification of dyestuffs on the fiber Appendix Index 531 p 8 vo. il.

KNECHT, R., and FOTHERGILL, J. B. Principles and Practice of Textile Printing. 615 p. 8 vo. il. 1913. $12.50

Radical changes have taken place in the textile printing industry, and these changes chiefly apply to the introduction of new and important processes and, to some extent, to plant and mechanical appliances. New styles have been introduced, of which those in which the coloring matters (e. g., insoluble, azo dyes, nitroso blue, paramine brown) are produced in the fiber are of paramount importance

CONTENTS. Part I.—Introduction Part II Methods of printing Part III.—Preparation of the cloth for printing Part IV—Preparation of colors for printing Part V.—Treatment of goods after printing. Part VI—Mordants, etc Part VII—Styles of printing Part VIII—Finishing of printed calicoes Part IX—Wool printing. Part X—Silk and half-silk printing Addenda

KNOX, JOSEPH. The Fixation of Atmospheric Nitrogen. 120 p. 12 mo. il. 1914. $1.00

CONTENTS. Fixation of atmospheric nitrogen as nitric and nitrous acids, or as their salts, Synthesis of ammonia and ammonium compounds from atmospheric nitrogen, Conversion of atmospheric nitrogen into compounds which readily yield ammonia; Bibliography.

KNOX, JOSEPH. Physico-chemical Calculations. 190 p 12 mo. 1912. $1.50

The book contains eleven chapters, dealing with the main subdivisions of physical chemistry. Each charter consists of a short introduction dealing with the theory required for the solution of the problems, a series of typical problems with complete solutions, and a list of problems for solution with answers

KOBER, GEORGE M., and HANSON, W. C., editors. Diseases of Occupation and Vocational Hygiene. 918 p. 8 vo. il. 1916. $8.00

KOESTER, FRANK. Hydroelectric Developments and Engineering. A practical and theoretical treatise on the development, design, construction, equipment, and operation of hydroelectric transmission plants. Second edition. 475 p. 4 to. il. 1909. $6.00

CONTENTS: Investigation. Economy in development. Gravity dams. Movable dams. Fish-ways, head race. Trenches. Flumes. Tunnels. Syphon system. Racks. Screens. Gates. Collecting basin. Steel, wooden and reinforced concrete penstocks. Power plant arrangement. Foundations. Superstructure. Turbines Draft tubes. Regulating devices. Oiling systems. Testing turbines. Generators. Switching room. Switch boards. Wiring diagrams. Bus bar, Oil switches. Relays. Transmission lines. Strength. Spacing and size of conductors. Transposition. Corona Effect Wooden and concreted poles. Reinforced concrete poles and towers. Steel towers. Insulators. Wall outlets. Substations. Transformers Converters. Motor-generators. Frequency changers Switch gear of substations. Line protection. Choke coils. Horn, multigap and fluid lightning arresters. Description of eight hydroelectric transmission plants, viz two American, one Mexican, one Norwegian, two German, one Swiss Italian, and one Austro Hungarian.

KOLLER, T. Cosmetics. A handbook of the manufacture, employment and testing of all cosmetic materials and cosmetic specialties. Translated from the German by Charles Salter. Third edition. 262 p. 8 vo 1920. $3.50

CONTENTS Purposes, Uses and Ingredients of Cosmetics, Preparation of Perfumes, Chemical and Animal Products Used in the Manufacture of Cosmetics; Oils and Fats Used, General Preparations, Mouth Washes and Tooth Pastes, Preparations for the Hair, Antiseptic Washes and Soaps, Preparations for the Skin, etc , Testing the Materials Used in Making Cosmetics

KOLLER, T. The Utilization of Waste Products. A treatise on the rational utilization, recovery and treatment of waste products of all kinds. Translated from the German. Third revised and enlarged English edition. 346 p. 8 vo. il. 1915. $5.00

CONTENTS: The Waste of towns, Blood and slaughter house refuse, Fat from waste, Tannery waste; Leather waste, Fur and feather waste; Waste horn; Fish waste, Mother of pearl waste; Vegetable ivory waste, Waste wood, Cork waste, Waste paper and bookbinders' waste, By products of paper and paper pulp works, Waste produced in the manufacture of parchment paper, Wool waste; Silk waste, Waste waters of cloth factories, Cotton spinners' waste, Jute waste, Utilization of rags, Coloring matters from waste, Residues in the manufacture of aniline dye; Dyers' waste waters, Waste produced in butter making; Molasses; Waste liquids from sugar works, Fruit, Waste products of the manufacture of starch; Brewers' waste, Wine residues; India rubber and caoutchouc waste; Amber waste, Utilization of turf or peat, Manufactured fuels, Illuminating gas from wastes and the by products of the manufacture of coal gas; By products in the treatment of coal tar oils; Ammonia recovery, Petroleum residues; By products in the manufacture of rosin oil, Soap makers' waste; Alkali waste and the recovery of soda; Sulphur; Salt waste; Gold and silver waste; Platinum residues; Iridium from goldsmiths' sweepings; Metal waste; Tinplate waste, Calamine slimes; Waste iron, By products of the manufacture of mineral waters; Infusorial earth; Meerschaum, Mica waste, Slate waste, Broken porcelain; Earthenware and glass; Utilization of waste glass.

KOPPE, S. W. Glycerine. Its introduction, uses and examination. For chemists, perfumers, soapmakers, pharmacists, and explosives technologists. 260 p. 12 mo. il. 1915. $3.50

KOPPESCHAAR, E. Evaporation in the Cane and Beet Sugar Factory. 126 p 8 vo. il. 1915. $2.50

A compilation based on standard works of evaporation, but arranged to serve the special requirements of the sugar industry.

KOZMIN, PETER A. Flour Milling. A theoretical and practical handbook of flour manufacture for millers, millwrights, flour-milling engineers, and others engaged in the flour-milling industry. Translated from the Russian by M. Falkner and Theodor Fjelstrup. 584 p. 4 to. il 1917. $8.50

CONTENTS Historical Outline of Flour Milling, General Ideas of the Raw Materials for Flour Production, Preparation of Grain for Grinding; Grinding the Grain; Grading the Product According to Size; Grading the Product According to Specific Gravity; Accessory Appliances and Mechanisms, Milling Diagrams, Construction of Mill Buildings; The Cost of Erecting and of Working Mills

It is a singular fact that there is no serious modern work on flour milling in the English language This work is the result of over twenty years of work and study of the technology of milling in nearly all of the flour producing countries of Europe as well as America, and will prove a practical and theoretical text for operative millers and for milling engineers who construct flour mills or design flour milling machinery The illustrations, because of their large number and detail, should prove especially helpful.

KRAEMER, H. Applied and Economic Botany. By Henry Kraemer, Ph.B., Ph.M., Ph.D., Professor of Pharmacognosy, University of Michigan, College of Pharmacy. Second edition. 822 p. 8 vo. il. 1920. $6.00

This book has been designed for use in technical and agricultural schools, pharmaceutical and medical colleges, for chemists, food analysts, and for those engaged in the morphological and physiological study of plants It contains a large amount of practical information concerning medicinal and economic plants

KRAEMER, HENRY. Scientific and Applied Pharmacognosy. 857 p. 8 vo. il. 1920. $6.00

The second edition of a most complete work on the pharmacognosy of vegetable and animal drugs, giving all the important information, with literature citation It will help the reader to apply science to practice and to solve a great variety of practical problems

CONTENTS: Introductory, Thallophytes; Schizomycetes, or bacteria; Algæ; Fungi; Archegoniates; Spermophytes, Gymnosperms, Angiosperms; Dicotyledons; Animal drugs, Powdered drugs.

KRAUCH, C. Chemical Reagents, Their Uses, Methods of Testing for Purity and Commercial Varieties. Translated from the German. Second Edition, Revised and Enlarged, by H. B. Stocks. 375 p. 8 vo 1919. $7.00

In this edition all the new reagents, such dimethylglyoxime, nitron, benzidine, etc., have been introduced and their uses described. Much new matter has been added in connection with the order reagents Temperatures are given in all cases in degrees centrigrade, while the whole of the molecular weights have been recalculated from the International Atomic Weights for 1918.

KRAUS, CHARLES A. The Properties of Electrically Conducting Systems. About 400 p. 8 vo. il. (American Chemical Society Monograph.) Ready about November 15, 1921.

Contents: (Tentative) Introduction. Mechanism of the conduction process. Relation between the conductance and concentration. The Conductance Function as applied to different solutions. General considerations relating to the Conductance Function in dilute and concentrated solutions. Dilute aqueous solutions. Relation between conductance and viscosity and pressure. Effect of temperature on conductance process. Osmotic phenomena. Mixed solvents Solubility of non electrolytes in the presence of electrolytes. Equilibria in mixtures of electrolytes. Results of transference experiments. Nature of the Ions in electrolytic solutions. Hypotheses relation to the problem of Ionization. Results of experiments with Concentration Cells General resume of the problem of electrolytic solutions Conduction process in fused electrolytes Conduction process in solid electrolytes Properties of metallic conductors. Evidence relating to the transfer matter in metallic conductors Conduction process in solutions of the metals in ammonia Resume of metallic systems

KRAYER, PETER J. The Use and Care of a Balance. 24 p. 12 mo. il. 1913. $1.00

The author has had fourteen years' experience in making and adjusting analytical weights and ten years' experience in visiting laboratories as an adjuster of balances and weights. He describes the setting up of a new balance, and of testing for zero point, equality of arms and sensitiveness; also how to improve a balance whose adjustment has become imperfect through use. This book should prove to be very useful in laboratories.

KREMANN, R. The Application of Physico-chemical Theory to Technical Procerses and Manufacturing Methods. Authorized translation by Harold E. Potts, M Sc. 215 p. 8 vo. il. 1914. $3.00

Contents The two fundamental laws of the mechanical theory of heat. Reaction velocity and catalytes Other special applications of the law of mass action The influence of temperature on the equilibrium constant. Dissociation pressure Application of the phase rule Application of the phase rule to solid liquid systems. Transformation phenomena in hydraulic binding agents Other applications of the phase rule. The distribution law. Reciprocal pairs of salts.

KUNBERGER, A. F., editor. Gas Chemists Handbook; compiled by Technical Committee, Sub-Committee on Chemical Tests, 1916, of the American Gas Institute. 1916. $3.50

LADENBURG, A. Lectures on the History of the Development of Chemistry Since the Time of Lavoisier. By Dr. A. Ladenburg, Professor of Chemistry in the University of Breslau. Translated from the second German edition by Leonard Dobbin xvi + 374 p. 8 vo. cloth. 1920 $1.85

LAFAR, FRANZ. Technical Mycology. Translated by Charles T. C. Salter. $6.00

The utilization of micro-organisms in the arts and manufactures. A practical work on fermentation and fermentative processes for the use of brewers and distillers, analysts, technical and agricultural chemists, pharmacists, and all interested in the industries dependent on fermentation.

Vol. I. Schizomycetic fermentation. 312 p. 8 vo il. 1910.

Contents: Section I - General morphology and physiology of the schizomycetes. Section II - General biology and classification of bacteria. Section III.—Principles of sterilization and pure cultivation. Section IV - Chromogenic, photogenic, and thermogenic bacteria Section V.- The heat resisting bacteria Their place in nature and their importance in the fermentation and foodstuff industries Section VI — Lactic fermentation and allied decompositions. Section VII —The formation of macus and allied phenomena of decomposition Section VIII - -Decomposition of transformations of organic nitrogenous compounds Section IX -Oxidizing fermentations.

Vol. II. Eumycetic fermentation. Index to both volumes. 558 p. 8 vo. il. 1911. $8.00

Contents: Section X Rudiments of general morphology and physiology of the eumycetes. Section XI --Fermentation by zygomycetes. Section XII Form, structure, and chemical composition of the yeast cell. Section XIII - Yeast nutrition and yeast culture. Section XIV.—Life history and variability of the saccharomycetes Classification of the saccharomycetes and schizosaccharomycetes Section XV — Morphology, physiology, and classification of certain technically important higher ascomycetes and allied forms Section XVI —General morphology, physiology, and classification of technically important budding fungi of the group "Fungi Imperfecti" Section XVII —The exzymes and enzyme actions of yeast

LAKE, E. F. Composition and Heat Treatment of Steel. 252 p. 8 vo. il. 1911. $3.00

Contents: Making of pig iron; Bessemer process; Electric furnace; Open hearth process; Crucible process; Ingredients and materials; Working steel into shape, Furnaces and fuel for heat treatment; Annealing, Hardening, Tempering; Carbonizing; Index.

LAKE, P., and RASTALL, R. H. A Textbook of Geology. Third edition. 528 p 8 vo il. 1920. $7.50

Contents: Introductory, Denudation, Rivers, Earth sculpture, Terrestrial deposits, Snow and ice as agents of denudation, Marine denudation; Marine deposits, Sedimentary rocks, Lakes, Earth movements; Vulcanicity, Igneous rocks; Metamorphism, Ore deposits and mineral veins, Principles of stratigraphy; Pre Cambrian or Archæan rocks; Cambrian system, Ordivician system; Silurian system; Devonian or Old Red Sandstone system; Carboniferous system; Permian system; The Trias or Triassic system; Jurassic system; Cretaceous system; Eocene and Oligocene series; Miocene and Pliocene series; Pleistocene series; Geological history of the British Isles; History of igneous activity in the British isles.

LAMBERT, THOMAS. Bone Products and Manures; an account of the most recent improvements in the manufacture of fat, glue, animal charcoal, gelatin and manures. 162 p. 8 vo. 1913. $3.50

Contents: Bones and Their Products; Glue; Gelatine; Uses of Glue, Gelatine and Size in Various Trades; Soils and Plant Life; Natural Manures; Artificial Manures; Mineral and Other Manures; Analysis of Raw and Finished Products; Tables.

LAMBERT, THOMAS. Glue, Gelatine, and Their Allied Products. A practical hand-book for the manufacture, agriculturist and student of technology. 155 p. 8 vo. il. 1905. $2.00

Contents: Historical, Properties of glue and gelatine. Installation of works. Glue. Gelatine. Size and Isinglass. Treatment of effluents produced in glue and gelatine making. Liquid and other glues, cements, etc. Uses of glue and gelatine. Residual products from glue and gelatine. Analyses of raw and finished products. Appendix. Tables. Index.

LAMBERT, T. Lead and Its Compounds. 226 p. 8 vo. il. 1902. $3.50

Contents: History; Distribution; Composition of lead; Dressing of lead ores, Smelting of lead ores, Condensation of lead fume; Desilverization; Lead pipes and sheets, Litharge and massicot; Lead poisoning; Lead substitutes; Zinc and its compounds; Pumice stone; Drying oils and siccatives; Classification by color of mineral pigments; Analysis of raw and finished products.

LAMBORN, L. I. Cotton Seed Products. 253 p. 8 vo. 1916 $4.00

LAMBORN, L. I. Modern Soaps, Candles, and Glycerin. A practical manual of modern methods of utilization of fats and oils in the manufacture of soaps and candles, and the recovery of glycerin. 688 p. 8 vo. il. 1918. $10.00

Contents: The soap industry, Raw materials of soap making; Bleaching and purification of soap stock; Chemical characteristics, Mechanical equipment of a factory; Cold process and semi-boiled soap; Grained soap; Settled rosined soap, Milled soap base; Floating soap, Shaving soaps; Medicated soap; Essential oils and soap perfumery; Milled soap; Candles; Glycerin; Examination of raw materials and factory products.

LANDOLT, H. The Optical Rotating Power of Organic Substances and Its Practical Applications. By Dr. Hans Landolt, Professor of Chemistry in the University of Berlin. Second edition. Authorized English translation. 751 p. 8 vo. il. 1902 $7.50

Contents: Part First—General conditions of optical activity Part Second Physical laws of circular polarization. Part Third—Numerical values for the rotating power Specific rotation. Part Fourth--Apparatus and methods for the determination of the specific rotation. Part Fifth—Practical applications of optical rotation. Part Sixth—Constants of rotation of active bodies.

LANE-CLAYTON, JANET E. Milk and Its Hygienic Relations. 356 p. 8 vo. 1916. $3.25

LANGBEIN, GEORGE. Electro-deposition of Metals. Translated, with additions by William T. Brannt. Eighth edition, revised and enlarged. 863 p. 8 vo. 185 il. 1920. $7.50

A practical, comprehensive work, comprising electroplating, galvanoplastic operations and electrotyping, deposition of metals by the contact and immersion processes, coloring of metals, lacquering, methods of grinding and polishing, and hundreds of tested formulæ and trade secrets, as well as descriptions and applications of voltaic cells, dynamo electric machines and plating shop equipment. A complete exposition of all materials and processes used in every department of the act.

LANGE, K. R. By-Products of Coal-gas Manufacture. Translated by Charles Salter. 162 p. 12 mo. 1915. $2.50

Contents: Production of Coal Gas; Coke; Retort Graphite; Gas Tar; The Gas Liquor; Treatment of the Gas Purifying Agents, Treating the Cyanogen Sludge; Treating the Crude Liquors; Treatment of the Crude Ammonium Thiocyanate and Cuprous Thiocyanate; Potassium Ferricyanide; The Cyanogen Pigments; Sulphur and Sulphuric Acid.

LASCELLES, T. W. Engraving. (Pitman's Common Commodities and Industries) 118 p. il. 12 mo 1920. $1.00

Contents A sketch of the history of engraving; Line engraving, The preparation of wood for wood engraving, Wood engraving; Etching; Mezzotint engraving, Dry point etching, Monotypes, Proofing wood engraving, Copper-plate printing or, proofing; Engravers' studio, Steel facing.

LASSAR-COHN, E. An Imtroduction to Modern Scientific Chemistry. Translated from the second German edition by M. M. Pattison Muir. New edition. 358 p. 12 mo. 1908. $2.25

Contents. List of the Elements; Hydrogen Gas; Chlorine, Bromine, Iodine, Fluorine, and Their Compounds with Hydrogen, Hydrochloric Acid Gas; Acids, Bases and Salts, Hydrobromic, Hydriodic and Hydrofluoric Acid; Atoms and Their Weights; Calculating Formula from the Results of Analyses; Molecules and Their Weights; Oxygen, Sulphur; Sulphuric Acid; Acid Salts; Double Salts; Basic Salts; Nitrogen; Nitric Acid, Aqua Regia; Explosives; Phosphorus, Various Modifications of Certain Elements; Ozone; Phosphoretted Hydrogen; Building up of Plants from Inorganic Substances; Arsenic; Antimony, Carbon, Organic Chemistry; Valencies of the Elements; Chemistry of Organized Substances; Asymmetric Carbon Atom; Manufacture of Coal-Gas; Acetylene Gas, Petroleum; Flame; Silicon; The Metals; The Light Metals; Preparation of the Light Metals by Electricity; Potassium; Sodium, Calcium, Magnesium; Aluminum; The Systematic Arrangements of the Elements

LASSAR-COHN, E. Application of Some General Reactions to Investigations in Organic Chemistry. Authorized translation by J. Bishop Tingle, Professor of Chemistry in the McMaster University, Toronto. 101 p. 12 mo. 1904. $1.25

The book deals with the fundamental principles and generalizations underlying organic chemistry.

LASSAR-COHN, E. Chemistry in Daily Life. Translated by M. M. Pattison Muir, M.A. Fifth edition, revised and augmented. 318 p. 12 mo. il. 1916. $2.50

This book embodies a course of lectures delivered by the author and shows that chemical phenomena are intimately bound up with our daily lives.

Contents: Breathing. Nature of flame. Food of plants. Mixed diet. Quantity of food that must be consumed, and nutritive values of the chief foods. Wine vinegar. Tanning. Oil painting. Potash. Glass. Noble and base metals. Alloys. Alkaloids. Index.

LATTA, NISBET. American Producer Gas Practice and Industrial Gas Engineering. 547 p. 8 vo. 1910. $6.00

CONTENTS: Producer operation; The producer; Cleaning the gas; Works details; Producer types; Moving gases; Solid fuels; Physical properties of gases; Chemical properties of gases; Gas analysis, Gas power; Gas engines; Furnaces and kilns; Burning lime and cement; Preheating air; Doherty combustion economizer, Combustion in furnaces, Temperature, radiation and conduction; Data; Heat measurement; Flues and chimneys; Materials; Useful tables; Glossary

A manual in simple language, of producer gas engineering practice, as applied to everyday operations upon a practical and commercial basis, omitting any theorizing and laboratory results unsuitable to commercial and manufacturing conditions. Readable alike to the engineer, operator and promoter.

LAUCKS, I. F. Commercial Oils, Vegetable and Animal, with Special Reference to Oriental Oils. 138 p 16 mo. 1919. **$1.50**

This book is intended for the non technical man in the oil trade

LAW, EDWARD F. Alloys and Their Industrial Application. Second edition. 332 p. 12 mo il. 1909. **$5.00**

This volume summarizes the existing state of our knowledge of mixed metals, paying special attention to the general principles and essential facts while omitting all the unimportant details, and secondly, applies that knowledge to the industrial alloys in every day use.

CONTENTS. Introduction. Properties of alloys Methods of investigation. Constitution Influence of temperature on properties. Corrosion of alloys. Copper alloys (bronze) Copper alloys (brass). Copper alloys (special bronzes and brasses). German silver and miscellaneous copper alloys. White metal alloys, lead, tin, and antimony. Antifriction alloys Aluminum alloys. Silver and gold alloys. Iron alloys. Miscellaneous alloys. Index.

LAZELL, E. W. Hydrated Lime. 95 p. 8 vo. 1915. **$0.60**

LEACH, A. E., and WINTON, A. L. Food Inspection and Analysis. 1090 p. 8 vo. il. 1920. **$8.50**

CONTENTS: Food analysis and official control The laboratory and its equipment Food, its functions, proximate components, and nutritive value. General analytical methods The microscope in food analysis. The refractometer Milk and milk products Flesh foods Eggs Cereals and their products, legumes, vegetables and fruits Tea, coffee and cocoa. Spices. Edible oils and fats Sugar and saccharine products. Alcoholic beverages Vinegar Artificial food colors Food preservatives Artificial sweeteners Flavoring extracts and their substitutes. Vegetable and fruit products Determination of Acidity by means of the hydrogen electrode. Appendix The Food and Drugs Act The Meat Inspection Law Photomicrographs of pure and adulterated foods and of food adulterants. Minimum percentages of alcohol in wines corresponding to Halphen ratios

LEAVENWORTH, WM. STOWELL. Inorganic Qualitative Chemical Analysis. 153 p. 8 vo. 1906. **$1.50**

CONTENTS: Groups of the metals; Reactions of the metals, Reactions of the acids; Analysis of the acids, Examination of the dry acid salts, Preparation of the solution, Groups of the acid, Analysis of the acids in solution; Detection of the halogens, Detection of nitric acid, Examination of the solids; Solution of solids; Complete analysis of all the groups; Spectrum analysis of Groups V and VI, The reactions of the rare elements; The reagents; The list of apparatus, The table of the elements, The table of solubilities

LE BAS, GERVAISE. Molecular Volumes of Liquid Chemical Compounds. 287 p. 8 vo. 1915. **$3.00**

LE BLANC, MAX. The Production of Chromium and Its Compounds by the Aid of the Electric Current. By Dr. Max Le Blanc, Professor and Director of the Physical Chemical (Electrochemical) Institute of the Technical High School, Karlsruhe. 122 p. 8 vo., 1904. **$1.50**

CONTENTS: I.—Obtaining of metallic chromium (A) By electrolysis of aqueous solutions (B) By the use of high temperatures II.—The obtaining of compounds of chromium with metals (A) By electrolysis of aqueous solutions (B) By the use of high temperatures III.—Obtaining of the compounds of chromium with the non metals. (A) Carbon compounds. (B) Silicon compounds. (C) Phosporous compounds. (D) Sulphur compounds. (E) Oxygen compounds. Appendix.

LEEDS, F. H., and BUTTERFIELD, W. J. A. Acetylene: the principles of its generation and use Second edition, revised and enlarged. 396 p. 8 vo. il. 1910. **$3.25**

CONTENTS: Introductory. The cost and advantages of acetylene lighting. The physics and chemistry of the reaction between carbide and water. The general principles of acetylene generation -acetylene generating apparatus. The selection of an acetylene generator. The treatment of acetylene after generation The chemical and physical properties of acetylene. Mains and service pipes- subsidiary apparatus Combustion of acetylene in luminous burners their disposition Incandescent burners—heating apparatus, motors, autogenous soldering. Carburetted acetylene. Compressed and dissolved acetylene mixture with other gases Sundry uses Portable acetylene lamps and plant Valuation and analysis of carbide. Descriptions of generators Index.

LEHNER, S. Ink Manufacture. Including writing, copying, lithographic, marking, stamping and laundry inks. Translated from the German of the fifth edition by A. Morris and H. Robson. 174 p. 8 vo. il. 1914. **$2.50**

CONTENTS: Varieties of ink; Writing inks; Raw materials of tannin inks; Chemical constitution of the tannin inks; Recipes for tannin inks; Logwood tannin inks; Ferric inks; Alizarine; Extract, logwood copying inks; Hektographs; Hektograph and safety inks; Ink extracts and powders; Preserving inks; Changes in ink and the restoration of faded writings; Colored inks—red, blue, violet, yellow, green, metallic and Indian; Lithographic inks and pencils; Ink pencils; Marking inks; Ink specialties; Sympathetic inks; Stamping inks; Laundry or washing blue.

LEIGHOU, ROBERT B. Chemistry of Materials of the Machine and Building Industries. 449 p. 8 vo. 75 il. 1917. **$3.50**

The chemical properties of the materials employed in the various branches of building construction and equipment, and in machinery construction and operation, are covered clearly from the point of view of the user.

CONTENTS: Preface. Water for steam generation; Fuels; Refractory materials for furnaces; Iron and steel; The corrosion of iron and steel; The non ferrous metals, The non ferrous alloys; Foundry sands; Building stones; Lime and gypsum products; Portland cement; Clay and clay products; Paints, varnishes, stains and fillers; Lubricants; Glue; Rubber, electrical insulating materials; Primary electric cells; Secondary cells; Hydrometry.

LEVY, DONALD M. Modern Copper Smelting. Being lectures delivered at Birmingham University greatly extended and adapted, and with an introduction on the history, uses and properties of copper. 259 p. 8 vo. il. 1912. **$4.00**

The lectures embodied in this volume are based largely upon the results of a study of the practice as conducted at the best organised smelters and refineries in the United States, at which the author has had the opportunity of spending considerable time. The scope is given in a clear concise way, dealing broadly with the principles underlying the Modern Methods, illustrated with examples of working practice from personal observation The subject matter of the lectures has been extended by the addition of An Introduction on the History, Uses and General Metallurgy of Copper as Applied to Modern Practice.

LEVY, S. I. Modern Explosives. (Pitman's Common Commodities and Industries.) 109 p 12 mo. il. 1920. **$1.00**

CONTENTS: Modern explosives and their raw materials; The chemistry of explosives manufacturing; The acid section of an explosives factory, The manufacturing of propellant explosives, Preparation of high explosives; Explosives in war and peace, Chemistry and national welfare

LEWES, V. B. Liquid and Gaseous Fuels and the Part They Play in Modern Power Production. 348 p. 8 vo. il. 1907. **$3.00**

CONTENTS: Combustion; Formation and Composition of Fuel; Determination of Calorific Value; Liquid Fuels, Use of Liquid Fuels; Liquid and Gaseous Fuels, Manufacture of Coal Gas; Use of Coal Gas for Heating and Power; Water Gas; Poor Fuel Gas; The Fuel of the Future

LEWES, V. B. The Carbonisation of Coal. A scientific review of the formation, composition and destructive distillation of coal for gas, coke and by products. 330 p. 8 vo il. 1914. **$5.00**

CONTENTS: The formation, composition, classification, and distribution of coal. Form of retorts used in gas manufacture. Coke ovens and their development Conditions existing in the destructive distillation of coal Primary gaseous products of the destructive distillation of coal and the bodies from which it has been formed Tar; its formation, use and decomposition Coke. Nitrogen and sulphur of coal, and their recovery. Modern coal gas Appendix

The chemical and mechanical principles involved in the destructive distillation of coal are carefully pointed out and the work of various investigators critically presented together with much data gathered from the author's own recent investigations and he attempts to define the probable lines along which future advances in the carbonization of coal may be expected.

LEWES, V. B., and BRAME, J. S. S. Service Chemistry; being a short manual of chemistry and metallurgy and their application in the naval and military services. 576 p. 8 vo. 1913. **$6.75**

LEWIS, WILLIAM C. M. A System of Physical Chemistry. Second edition. 3 vols. 8 vo. 1918-1919. **$11.50**

LIBBY, WALTER. Introduction to the History of Science. 288 p. 12 mo. 1917. **$1.50**

LIDDELL, DONALD M., comp. **The Metallurgists and Chemists' Handbook;** a reference book of tables and data for the student and metallurgist. Second edition, revised and enlarged. 656 p. 16 mo. il. 1918. **$5.00**

A compact reference pocketbook of tables and data for the metallurgist and chemist Six hundred pages, packed with tables, formulæ, constants, and similar reference data to supply the fact or figure which you would otherwise spend hours in searching for. Mr. Liddell bases his collection on extensive practical experience as a metallurgist, coupled with the close observation of the requests for information which came to him through a considerable period as managing editor of "The Engineering and Mining Journal." This handbook does not undertake to cover the field of the "General Metallurgy" There are no lengthy discussions of processes or apparatus. Instead are boiled down facts and figures—concise reference data from all sources are made available in a single convenient handbook.

SECTION HEADINGS: Mathematics Price and production statistics. Physical constants. Chemical data. Sampling; Assaying and analysis. Ore dressing. Cyanidation. Fuels and refractories Mechanical engineering and construction. General metallurgy First aid.

LIDGETT, ALBERT. Petroleum. (Pitman's Common Commodities and Industries.) 168 p. 12 mo. il. 1919. **$1.00**

CONTENTS: Petroleum and its origin, The oil fields of the world; How petroleum is produced; The refining of petroleum, Transport by land and sea; Petroleum as fuel, Petroleum as a lighting agent; Internal combustion engines, Petroleum in England, Petroleum in the British Empire; Petroleum's part in the great war; The Scottish shale oil industry; A few notable petroleum enterprises, Statistical

LINCOLN, A. T. Physical Chemistry. By Azariah T. Lincoln, Professor of Physical Chemistry, Rensselaer Polytechnic Institute, Troy, N. Y. 555 p. 12 mo. 1918. **$3.50**

This work comprises the fundamental material which serves as the basis for a course in elementary Physical Chemistry. As this information is valuable to all workers in chemistry and as not much mathematics is necessary for a comprehension of the greater part of it, in general the presentation is nonmathematical Special emphasis is placed upon the accuracy of statement of the fundamental conceptions of chemistry, upon the historical development of certain ideas, as well as upon the industrial application of these principles. The use of the phase rule as a basis of classification and its practical applications has been particularly emphasized, as has also the new and important department of colloid chemistry Since the principles and their applications can best be emphasized by numerical examples, the fundamental equations have been collected and rearranged, as well as solved for various terms, and there have been included several hundred problems.

LIND, SAMUEL C. Chemical Effects of Alpha-Particles and Electrons. 180 p. 8 vo. il. 1921. **American Chemical Society Monograph.** **$3.00**

Contents: Radiochemistry; Brief outline of radioactivity and some properties of the radiations; Electrical effects—ionization, Qualitative radiochemical effects, Chemically quantitative investigations in liquid systems, Reactions produced by radium emanation, Relation between gaseous ionization and radiochemical effects, Kinetics of the chemical reactions produced by radium emanation, Additional relationships of the radiochemical effects, Photochemical equivalence law, Positive rays and recoil atoms, Atomic disintegration by alpha particles

LINDGREN, W. Mineral Deposits. By Waldemar Lindgren, William Barton Roger Professor of Economic Geology, in charge of the Department of Geology, Massachusetts Institute of Technology, formerly Geologist of the U. S Geological Survey. 957 p. 8 vo. il. 1919. **$6.00**

A scientific treatment of economic geology It is a description, by classes and type examples, of the occurrence, structure and origin of the principal deposits of metallic and non metallic minerals It is based on the author's broad experience

LIPKA, J. Graphical and Mechanical Computation. By Joseph Lipka, Ph D, Assistant Professor of Mathematics in the Massachusetts Institute of Technology 264 p 8 vo 1918. **$4.00**

LLOYD, STRAUSS L Mining and Manufacture of Fertilizing Materials and Their Relation to Soils. 159 p 12 mo il 1918. **$2.00**

Contents: Chemistry of fertilizers, Origin and composition of soils; The relation between soils and fertilizing materials, Pebble phosphate ore dressing and milling, Hard rock phosphate ore dressing and milling, Phosphorus, Artificial manure manufacture, Manufacture of superphosphate, Compound manures, Nitrogenous manures, The fixation of atmospheric nitrogen, Manufacture of cyanamide and nitrate of lime—Experiments with cyanamide, Potassic manures—Manufacture from crude salt, feldspar, sunflower and kelp plants, On the examination of commercial fertilizers and materials; On the examination of soils.

LOCK, R. H. Rubber and Rubber Planting. By R H. Lock, Sc D. 8 vo. il. 1914. **$1.65**

LOCKHART, L. B. American Lubricants From the Standpoint of the Consumer. Second edition, revised and enlarged 8 vo. il. 1920. **$4.00**

Contents: Crude petroleum The refining of petroleum The refining products. Friction and lubrication. Lubrication of internal combustion engines Automobile lubrication The lubrication of electrical machinery. The lubrication of steam cylinders and steam engines The lubrication of steam railways The lubrication of cotton mills and other textile mills. The lubrication of miscellaneous plants and machines Physical methods of testing lubricating oils Chemical methods of testing lubricating oils. Lubricating greases Methods for testing and analysis of greases Animal and vegetable oils. Methods of testing fatty oils. Specifications for fatty oils Specifications for steam cylinder oils. Specifications for turbine oils Specifications for cylinder oils for internal combustion engines Specifications for transmission oils and crank case oils Specifications for compressor oils Specifications for engine oils, paraffin oils and car oils Specifications for printing oils and light machine oils Specifications for transformer oil, petroleum residues and miscellaneous oils Standard government specifications for lubricants Specifications for cutting oils. Specifications for greases and graphite. Specifications for boiler compounds Specifications for fuel oil. Specifications for kerosenes Specifications for gasoline Gasolines. Kerosene. Tables. Index

LOEB, JACQUES. Forced Movements, Tropisms and Animal Conduct. 209 p. 8 vo. il. 1918. **$2.50**

Contents Introduction, The symmetry relations of the animal body as the starting point for the theory of animal conduct, Forced movements, Galvanotropism; Heliotropism the influence of one source of light: (1) General facts, (2) direct proof of the muscle tension theory of heliotropism in motile animals, (3) heliotropism of unicellular organisms, (4) heliotropism of sessile animals An artificial heliotropic machine, Asymmetrical animals, Two sources of light of different intensity; The validity of the Bunsen-Roscoe law for the heliotropic reactions of animals and plants, The effect of rapid changes in intensity of light; The relative heliotropic efficiency of light of different wave lengths; Change in the sense of heliotropism; Geotropism, Forced movements caused by moving retina images, Rheotropism, Anemotropism, Stereotropism; Chemotropism, Thermotropism, Instincts, Memory images and tropisms, Literature.

LONES, T. E. Zinc and Its Alloys. (Pitman's Common Commodities and Industries) 127 p. il. 1920. **$1.00**

Contents: Zinc Its history, properties and uses, Zinc ores and other sources of zinc, Dressing zinc ores, Calcining and roasting zinc ores, Zinc smelting, Hydrometallurgical processes; Alloys of zinc

LORD, N. W., and DEMOREST, D. J. Metallurgical Analysis. By Nathaniel W. Lord, late Professor of Metallurgy, Ohio State University Revised by Dana J. Demorest, Professor of Metallurgy, Ohio State University International Chemical Series. Fourth edition, revised and enlarged. 342 p 8 vo. il 1916 **$3.00**

A standard manual that covers practically all the methods of chemical analysis likely to be used by the metallurgical chemist

Contents. I.- The selection and preparation of samples for analysis. II.- The analysis of limestones. III—The determination of iron in ores IV—The determination of phosphorus in iron ores, iron and steel. V—The determination of silicon in iron. VI—The determination of manganese VII—The determination of sulfur. VIII.—The determination of carbon in pig iron and steel. IX—The determination of nickel and cobalt in steel. X—The determination of vanadium in steel XI The determination of tungsten, chromium and silicon in steel XII—Determination of molybdenum in steel XIII.—The determination of titanium XIV—The determination of copper in iron and steel. XV.—Determination of arsenic in iron and steel. XVI—The determination of aluminum in iron and steel. XVII.—The determination of nitrogen in steel. XVIII.—The determination of oxygen in steel. XIX.—The determination of hydrogen in steel XX.—The determination of spelter and tin plate coating. XXI.—The determination of zinc in ores. XXII.—The determination of copper in ores. XXIII.—The determination of lead in ores. XXIV—The determination of tin in ores. XXV.—The analysis of refined copper XXVI.—The analysis of refined lead. XXVII.—The analysis of bearing metals. XXVIII.—The analysis of spelter. XXIX.—Brass and bronze analysis XXX.—The analysis of coal and coke. XXXI—The analysis of gases. XXXII.—The analysis of clays and other silicates. XXXIII.—Softening water for boiler use. XXXIV.—Calculation of normal solutions.

LOUIS, HENRY. Metallurgy of Tin. 138 p. 8 vo. 1911 **$2.50**

LOVEJOY, ELLIS. Burning Clay Wares. 232 p. 8 vo. il. 1920. **$5.00**

Contents Clays and their mineral contents, The burning process, Burning behavior of clays, Fuel and combustion, Producer gas, Stacks, Furnaces, Kilns; Some notes on setting, The continuous kiln; Car tunnel kiln, Appendix, Equalization tables.

LOVEJOY, ELLIS. Drying Clay Wares. 166 p. 8 vo. il. 1916. **$1.00**

LOW, ALBERT H. Technical Methods of Ore Analysis. 388 p. 8 vo. 1919. **$3.50**

In this eighth edition, a number of new methods for Molybdenum, Potassium, Tungsten and Uranium, which have developed since the last printing, have been added

LOW, DAVID ALLAN. A Pocket-book for Mechanical Engineers. 740 p. 16 mo. il 1918. **$3.50**

LUCAS, E. W., and STEVENS, H. B. The Book of Pharmacopeias and Unofficial Formularies. 532 p. 12 mo. 1915. **$3.00**

LUCAS, A. Legal Chemistry and Scientific Investigation. 181 p. 8 vo. 1920. **$3.40**

Contents Introduction Notes on cases Alcoholic liquors. Antiquities Blood stains Building materials Bullets Clothing Counterfeit coins Damage to crops Documents Dust and dirt Explosions Fibres Firearms Foods and drugs Gold and silver. Hashish Poisons Robbery Stains and marks String and rope. Textile fabrics Tobacco Traps for criminals Index

LUCKE, C. E. Engineering Thermodynamics. By Charles Edward Lucke, Ph D, Professor of Mechanical Engineering, Columbia University. 1176 p. 8 vo. il. 1912. **$8.00**

The most comprehensive treatment ever published of the industrial problems dealing with heat, so written as to enable engineers, draftsmen and managers to get a numerical answer to the everyday problems of design and performance of heating, refrigerating and power apparatus.

LUCKE, C. E., and FLATHER, J. J. A Textbook of Engineering Thermodynamics. An abridgement of Engineering Thermodynamics. By Charles Edward Lucke, Ph D., Professor of Mechanical Engineering in Columbia University and John J Flather, Ph B, M M E, Professor of Mechanical Engineering in the University of Minnesota. 688 p. 8 vo. il. 1915. **$5.00**

LUCKIESH, M. Color and Its Applications. 431 p. 8 vo. il. Second edition, enlarged. **$4.00**

(Author is physicist with the Nela Research Laboratory National Lamp Works of the General Electric Co.)

A treatise of the subject of color from the underlying scientific principles to the many applications The object has been not only to discuss the many applications of color, but to establish a sound scientific basis for these applications The early chapters are devoted to a discussion of light in Relation to Color and of the Production, Measurements and Analysis of color Considerable attention is given to the relation of color and vision, the physiological and psychological phenomena of vision being of great importance in every application of color The later chapters are devoted to the many applications of color The book is authoritative, well illustrated, and contains many references and a wealth of new material It was written by an investigator in the general field of color and is therefore not narrowly limited in scope. It fills a distinct gap that has existed on the book shelves

Contents Light, The Production of Color; Color-Mixture, Color Terminology, The Analysis of Color, Color and Vision, The Effect of Environment on Color, Theories of Color Vision, Color Photometry; Color Photography, Color in Lighting, Color Effects for the Stage and Displays, Color Phenomena in Painting; Color Matching; The Art of Mobile Color; Colored Media.

LUNGE, GEORGE. Coal-tar and Ammonia. Fifth thoroughly revised and enlarged edition. In three volumes, not sold separately. 1600 p. 8 vo. il. 1916. **$25.00**

Abridged Contents: Coal tar. Introductory; Processes for obtaining coal tar, The properties of coal-tar and its constituents; The applications of coal tar without distillation; The first distillation of coal-tar, Pitch, Anthracene oil, Creosote oil; Carbolic oil (middle oil); Light oil, Working-up the light naphtha into final products. Ammonia. Historical notes on ammonia; Sources from which ammonia is obtained, The composition and analysis of ammoniacal liquor, and properties of its constituents, The working up of ammoniacal liquor into concentrated liquor and liquid ammonia; Manufacture of sulphate of ammonia; Other technically important ammonium salts.

This new edition will be of great importance, as six years have elapsed since the publication of the fourth edition, which has been out of print for some time. In preparing the revised issue the author is not only embodying in it all the new matter collected by himself on visits to factories and through communications with private sources, but also that which he has found in the books and periodicals published in the various industrial countries, and in the extremely numerous specifications of those countries.

LUNGE, GEORGE. Technical Chemists' Handbook. Tables and methods of analysis for manufacturers of inorganic chemical products. Second edition, revised. 280 p. 8 vo. 1917. **$4.00**

Contents: General tables; Fuel and furnaces, sulphuric acid manufacture, saltcake and hydrochloric acid; Bleaching powder and chlorate of potash manufacture; Soda ash manufacture by the Leblanc process; Manufacture of soda by the ammonia process; Caustic soda;

Electrolytic alkaline liquors; Nitric acid manufacture, Potassium salts; Ammonia manufacture; Coal-gas manufacture, Calcium carbide and acetylene; Examination of the raw materials and products of the manufacture of fertilizers; Alumina preparations, Cement industry, Preparation of standard solutions; Rules for sampling, Comparison of the hydrometer degrees according to Baumé and Twaddell, with the specific gravities, Value of alkali per ton.

In this edition all analytical factors have been recalculated on the basis of the atomic weights published by the International Committee for 1916. This has involved numerous changes, many of them of importance even for merely practical purposes. The tables of specific gravities and other tables have been selected from among the most recent reliable determinations.

LUNGE, GEORGE. Technical Gas Analysis. 422 p 8 vo il. 1914. $4.50

Contents: *General Remarks on Technical Gas* Sampling, Measurement of Gases, Measuring Apparatus, Adjustment or Calibration of Gas Measuring Apparatus; Measuring in Gas Meters, Various Apparatus for Gas Analysis. *Methods Employed in Technical Gas Analysis* Estimation of Solid and Liquid Admixtures in Gases, Estimation of Gases by Absorption: (a) by gas volumetric methods (b) by titration, (c) by weight; Estimation of Gases by Combustion, Gas Analysis by Optical and Acoustical Methods, Separation of Gases by Low Temperatures; Estimation of the Specific Gravity of Gases, Measurement of Pressure and of Draught; Determination of the Calorific Value and Illuminating Power of Gases *Special Methods for Detecting and Estimating Various Gases and Vapors Occurring in Technical Operations Analysis of Gaseous Mixtures Produced on a Large Scale Compressed and Liquefied Gases Gas Volumetric Analysis Appendix* Tables

A comprehensive and generally useful work for chemists working on gas analysis The work of other investigators is quoted only where it would be helpful toward a better use of the book, and for this reason the author does not attempt to mention everything published on the subject. This book superseding, as it does, Winkler and Lunge's previous work, is not based on the former, and is in reality an entirely new treatise.

LUNGE, GEORGE. The Manufacture of Sulphuric Acid and Alkali. With the collateral branches A theoretical and practical treatise. In four volumes. (Three now ready)

Vol. I, Sulphuric Acid In three parts. Not sold separately Fourth edition. 1665 p. 8 vo. il. 1913. **Reprinting**

Contents. Historical and general notes on the manufacture of sulphuric acid. Raw materials of the sulphuric acid manufacture, including nitric acid. Properties and analysis of the technically employed oxides and acids of sulphur. Production of sulphur dioxide Construction of the lead chambers. Recovery of the nitrogen compounds. Chamber process. Purification of sulphuric acid Concentration of sulphuric acid Sulphuric acid works arrangement on the chamber process. Yields and costs Manufacture of Nordhausen or fuming oil of vitriol, and of sulphuric anhydride Other processes for manufacturing sulphuric acid. By products of the manufacture of sulphuric acid. Application of sulphuric acid and statistics. Addenda

Sulphuric and Nitric Acid. Supplement to Vol. I Fourth edition. 347 p. 8 vo il. **Reprinting**

Since the issue of the fourth edition very numerous contributions have been made to the industries described, and in response to numerous requests this material has been compiled and brought up to date in this supplemental volume The text arrangement is in the form of references to the large book, giving the number of the page in the subject matter which needed changing or amplification

Vol. II., Sulphate of Soda, Hydrochloride Acid, Leblanc Soda. Third edition, much enlarged In two parts, not sold separately. 1044 p. 8 vo. il. **Reprinting**

Contents: Properties and occurrences in nature of the raw materials and products of the alkali industry and their analysis, Manufacture of sulphate of soda from salt and sulphuric acid by the process of Hargreaves and Robinson, Other methods; Purification of sodium sulphate; The condensation of the hydrochloric acid produced in the manufacture of sulphates of soda, Manufacture of hydrochloric acid by other than ordinary methods; Weak acid, Control of condensation, Yields, costs, purification, pumping and conveyance of hydrochloric acid; Notes on alkali, Manufacture: Theory of the Leblanc process, The manufacture of black ash; Black ash and tank liquor, Manufacture of finished soda and bicarbonate; Yield and costs, Caustic soda; Tank waste.

Vol. III., Ammonia-Soda, Various Processes of Alkali Making and the Chlorine Industry. Third edition, much enlarged 784 p. 8 vo. il. 1917. **Reprinting**

Contents: The ammonia soda process. Historical and general. The ammoniacal solution of salt. The production of carbonic acid for the ammonia soda process. Precipitation of sodium bicarbonate by the carbonating process Filtering, drying and calcining the bicarbonate Recovery of the ammonia Combination of the apparatus, final products, costs, statistics. Other forms of the ammonia soda process Manufacture of commercial bicarbonate by the ammonia soda process Various processes of the alkali manufacture Manufacture of soda from cryolite; Directly from sodium chloride; from sodium sulphate without previous reductions to sulphide; from sodium sulphate after reduction to sulphide; from nitrate of soda and feldspar The chlorine industry.—General notes on chlorine. Manufacture of chlorine by manganese ore. Utilization of still liquor Original Weldon process. The Deacon process Other processes for the manufacture of chlorine Properties and behavior of the hypochlorites and of bleaching powder. Manufacture of bleaching powder. Bleach-liquors and other bleaching compounds. The chlorates. Appendix of statistical data.

Vol. IV. Electrolytic Methods. Edited by Professors Askenasy and Haber. **Reprinting**

LUNGE, GEORGE. Technical Methods of Chemical Analysis. English translation from the latest German edition, edited by Charles Alexander Keane, with the collaboration of eminent specialists. In three volumes. (Six parts.) 1908-1914. **Reprinting**

Vol. I. (In two parts.) 1024 p. 8 vo il.

Contents: Technical gas analysis; Fuel analysis; Sulphurous acid, nitric acid and sulphuric acid; Saltcake and hydrochloric acid; Sodium carbonate; The chlorine industry; Potassium salts; Cyanogen compounds; Clay; Clay wares, earthenware and glazes; Aluminum salts and alumina; Glass; Calcareous cements; Drinking water and water supplies; Feed water for boilers and water for other technical purposes; Sewage and effluents Soils, Air.

Vol. II. (In two parts.) 1204 p. 8 vo. il.

Contents Iron, Metals other than iron, and metallic salts. Artificial manures. Feeding stuffs. Explosives Matches and fireworks. Calcium carbide and acetylene. Illuminating gas and ammonia. Coal tar. Organic dyes.

Vol III. (In two parts) 1174 p. 8 vo. il.

Contents. Mineral oils, Lubricants, Oils, fats and waxes, Special methods of analysis employed in the oil and fat industries, Resins, balsams, and gum resins, Drugs and galenical preparations, Essential oils; Tartaric acid, Citric acid, Organic preparations, India rubber and rubber goods; Vegetable tanning materials, Leather, Ink, Sugar, Starch and dextrin; Alcohol, potable spirits, and liquors, Vinegar; Wine, Brewing materials and beer; Paper; Textile fibres, Inorganic colors.

LUPKE, ROBERT. The Elements of Electro-Chemistry. Translated by M M. Pattison Muir, M A. Second edition, revised and enlarged. 255 p. 12 mo. il. 1903. $2.50

Contents Introduction Part I Recent theories of electrolysis. The phenomena of electrolysis. Faraday's law Hittorf's transport numbers The law of Kohlrausch The dissociation theory of Arrhenius

Part II —The theory of solutions of Van't Hoff. Osmotic pressure. The vapor pressures of solutions Boiling points and freezing points of solutions Summary Aqueous solutions of electrolytes

Part III —The osmotic theory of the current of galvanic cells. Liquid cells Daniell cells. Reduction cells and oxidation cells The solution pressures of the metals. Intensity of fixation, and polarization Irreversible cells Accumulators The energetics of galvanic elements Index

LYNDON, L. Hydro-Electric Power. By Lamar Lyndon, author of "Storage Battery Engineering." In two volumes. 1916.

Vol. I. Hydraulic Development and Equipment. 408 p. 8 vo. il. $5.00

Vol. II. Electrical Equipment and Transmission. 360 p. 8 vo il. $4.00

This work is designed to meet the needs of engineers engaged in water power development It covers both the hydraulic and the electrical sides of hydro-electric plant design. Every part of the plant that the practicing engineer is expected to design can be designed from the information it contains.

MACOMBER, WILLIAM. Engineers' Handbook on Patents. 288 p. 16 mo. 1913. $2.50

Contents: Introductory; What is a patent?; The nature of invention; What is patentable, Patentable novelty; Obtaining of patents; Claim construction; Infringement; Patent litigation; Property rights; Index.

MacDONALD, G. W. Historical Papers on Modern Explosives. With an introduction by Sir Andrew Noble. 200 p. 8 vo. il. 1912. $2.75

Contents: Howard's discovery of fulminate of mercury; Braconnot's discovery of nitrostarch; Schonbein's discovery of guncotton; Guncotton in France, Scotland and England; The patents of Schonbein, Tonkin, and Abel, Letters from Berzelius, Hall and Schonbein on guncotton; The British Association Committee on guncotton, The manufacture of guncotton in Austria and at Waltham Abbey, Abel's work on guncotton; Sobrero's discovery of nitroglycerin; Nitroglycerin in Holland and England; Nobel's patents for the manufacture of nitroglycerin, dynamite, straight dynamite, blasting gelatine and gelignite and ballistite; The analysis and composition of nitroglycerin, The decomposition of nitroglycerin by caustic potash; Certain chemical decomposition of nitroglycerin

MacDOUGALL, FRANK H., Ph.D. Thermodynamics and Chemistry. 391 p 8 vo 52 figures. 1921. $5.50

This book gives the working knowledge of thermodynamics which is needed by all physical chemists and all teachers of chemistry The treatment is comprehensive, logical, accurate and clear, the applications being discussed very fully. Many examples are given, so that the reader can easily apply results in any particular case

Contents. Temperature; Actual gases, Heat, The first law of thermodynamics; Applications of the first law I, Applications of the first law—II; Thermochemistry, The second law of thermodynamics; Deductions from the first and second laws, Thermodynamic functions and thermodynamic equilibrium, Fusion, evaporation and sublimation, The phase rule, Applications of the phase rule I, Applications of the phase rule II; Applications of the phase rule III, Chemical equilibrium, Electromotive force, Surface tension and absorption, Radiation, Quantum theory; Nernst heat theorem.

McFARLAND, D. F., and HARDER, O. E. Preliminary Study of the Alloys of Chromium, Copper and Nickel. 60 p. 8 vo. 1916. $0.30

MacFARLANE, W. Laboratory Notes on Iron and Steel Analyses. By Walter MacFarlane, F I C, Principal of the Metallurgical Department, Staffordshire Education Committee. 478 p. 12 mo. il. 1909. $3.25

MacFARREN, H. W. Text Book of Cyanide Practice. 291 p. 8 vo. 1912. $3.00

Contents: History and development. Nature and properties of cyanides. Dissolution of gold and silver Suitability of an ore for cyanidation and interfering substances Chemistry of cyanide solutions. Alkalinity and lime. Ore testing and physical determinations Percolation Slime treatment and agitation Decantation Filtration Precipitation. Cleaning up Roasting and acid treatment. Fluxing and melting. Cyanidation of concentrate Roasting ore for cyanidation. Cyanide poising. Classified bibliography. Tables.

McHALE, C. F. Commercial Spanish. By Carlos F. McHale, Spanish Instructor in the National City Bank of New York. 330 p. 12 mo. 1918. $1.40

By virtue of its clear exposition of commercial procedure, its careful definitions of commercial terms, and its wealth of useful idioms, this book should appeal to students seeking a business training as well as to those primarily interested in learning Spanish. Additional valuable features are the many reproductions of commercial documents, a good index, and the Spanish-English and English-Spanish vocabularies.

MacINTIRE, H. J. Mechanical Refrigeration. A treatise for technical students and engineers. By H. J. MacIntire, M.M.E. Assistant Professor of Mechanical Engineering, University of Washington. 346 p. 8 vo. il. 1913. $4.00

A thorough discussion of insulating material, properties of refrigerants, and heat transmission.

McINTOSH, J. G. Industrial Alcohol. The production and use of alcohol for industrial purposes, and as a source of motive power. 260 p. 8 vo. il. 1907. $3.50

CONTENTS. Alcohol and Its Properties, Continuous Aseptic and Antiseptic Fermentation and Sterilization in Industrial Alcohol Manufacture; Manufacture of Industrial Alcohol from Beets, Grain, Potatoes; Wine, Spoilt Wine, Wine Marcs and Fruits, Sugar Cane and Sugar Cane Molasses; Plant for Manufacturing Alcohol, Uses of Alcohol in Industries, Manufacture and Uses of Various Alcohol Derivatives; Alcohol for Lighting, Heating and Motive Power.

McINTOSH, J. G. Manufacture of Varnishes and Kindred Industries. Based on and including the "Drying Oils and Varnishes," of Ach. Livache. (In three volumes.)

Vol. I. Oil Crushing, Refining and Boiling, Manufacture of Linoleum, Printing and Lithographic Inks, and India rubber Substitutes. Fourth greatly enlarged English edition. 8 vo. il. $7.00

CONTENTS: Oil crushing and refining; Theory and practice of oil boiling, Linoleum manufacture, Manufacture of printing inks; Rubber substitutes; Manufacture of driers; Detection by various methods of adulteration in linseed and other drying oils.

Vol II Varnish Materials and Oil Varnish Making 216 p 8 vo. il. 1920. $5.00

CONTENTS: Amber and amber oil varnishes; Asphaltum, Coal tar, bone and stearine pitch, India rubber; Gutta percha, Paraffin wax; Cleaning, assorting and fusing resins; Oil varnish making, Copal oil varnishes; Kauri copal varnishes, Brunswick black, Super black japan, Testing varnish, Utilization of residues; Utilization of varnish markers' waste products.

Vol. III Spirit Varnishes and Spirit Varnish Materials. 402 p. 8 vo. il. 1920. $6.00

CONTENTS. Solvents. Characteristics of spirit varnish solvents Source, preparation, and use of various solvents Alcohol, ether, and ethereal salts, oleo-resinous pine products terpenes camphors The oleo-resiniferous conifers Sources and methods of obtaining turpentine. Distillation of turpentine. Testing and substitutes, distillation and chemistry of resin Rosin spirit rosin oil. Chemistry of the terpenes. Wood tar, wood turpentine, wood creosote, etc Spirit varnish resins and coloring matters Benzoin, Dammar, kauri, etc Dragons' blood. Japanese, Chinese and Burmese lacquers Manilla copal Shellac Colors and stains Methods of manufacture Principles of spirit varnish manufacture Amber and asphaltum, collodion, and celluloid spirit varnishes. Gopal spirit varnishes, Dammar spirit varnishes India rubber insulating, mastic and matter spirit varnishes Rosin spirit varnishes Spirit varnishes, analysis and testing Technical valuation. The determination of the resins and solvents in spirit varnishes

McINTOSH, JOHN G. The Technology of Sugar. Third edition, revised and enlarged. 540 p. 8 vo. il. 1903. $6.00

CONTENTS: Beet sugar. A criticism of the arguments of present day beet-sugar pioneers, Valuation and purchase of sugar beets, Preliminary treatment, Diffusion; Carbonation and filtration, Concentration of beet juice to syrup in multiple effect evaporation vessels, Boiling beet syrup to strike point in vertical and horizontal vacuum pans; Centrifuging of beet sugar, Extraction of all available sugar from beet-sugar molasses; Cane sugar, The sugar cane and its cultivation; Sugarcane diffusion, Sugar refining; The chemistry of sugars—Analysis of commercial sugars and of merchandise, etc, containing sugars.

McKAIL, DAVID. Public Health Chemistry and Bacteriology. 417 p 8 vo 1912. $2.50

McKEE, RALPH H. Shale Oil. American Chemical Society Monograph About 275 p. Ready about February 1, 1922.

MACKENZIE, JOHN E., The Sugars and Their Simple Derivatives. 242 p. 8 vo. il. 1914. $3.50

The appeal of this book is to those interested in chemistry, medicine, brewing and distillation, sugar manufacture, etc, and much attention has been given to the subjects of metabolism, fermentation, and the manufacture of sugars It has been prepared to serve as a supplement to works on physiological chemistry and to technological works on brewing, distilling, sugar manufacture and sugar analysis.

CONTENTS. Introduction Sucrose. Maltose Lactose Glucose. Glucosamine Configuration Dioses, trioses and tetroses Pentoses. Methylpentoses. Aldohexoses. Methexoses. Disaccharides. Trisaccharides. Tetresaccharides. Glucosides. Fermentation. Metabolism Index.

MACLAREN, J. M. Gold. Its geological occurrence and geographical distribution. 687 p. 8 vo. 1908. $10.00

MACLEAN, HUGH. Lecithin and Allied Substances, The Lipins. 213 p. 8 vo. 1918. $2.75

CONTENTS: Introduction and nomenclature; The chemistry of the phosphatides; The occurrence, methods of extraction, isolation and purification of the phosphatides; The cerebrosides; Protagon; Alleged lipins; Plant lipins; The function of lipins.

McLEOD, ALEXANDER. Practical Instructions in the Search for and Determination of the Useful Minerals, including the rare ores. For the prospector, miner, and as a ready reference for everybody interested in the mineral industry. Second edition, greatly enlarged. 281 p. 16 mo. 1917. $2.50

MACLEOD, W. A., and WALKER, CHARLES. Metallurgical Analysis and Assaying. 318 p. 8 vo. il. 1903. $4.50

McMILLAN, WALTER G. A Treatise on Electro-Metallurgy. Revised by W. R. Cooper, M.A. Third edition, revised and enlarged. 425 p. 8 vo. il. 1910. $4.25

Embracing the application of electrolysis to the plating, depositing, smelting, and refining of various metals, and to the reproduction of printing surfaces and art-work.

McPHERSON, WILLIAM, and HENDERSON, WILLIAM EDWARDS. Course in General Chemistry. Second edition. 735 p. il. 8 vo. 1921. $3.00

CONTENTS. Matter and energy; Oxygen; Hydrogen; Properties of gases; Water, Hydrogen peroxide; The states of matter; The laws of chemical combination, The atomic theory; Equations and calculations; Valence; Carbon; Carbon dioxide; Nitrogen and the rare elements; Helium; Neon; Argon; Krypton; Xenon; The atmosphere, Solutions; Chlorine; Hydrochloric acid, Acids; Salts; Sodium, Sodium hydroxide; Bases; Ionization; Some applications of the theory of ionization; Compounds of nitrogen; Equilibrium; Sulphur; Selenium, Tellurium; Hydrolysis; The periodic law; The structure of atoms; The chlorine family; The oxygen compounds of the halogens; Some compounds of carbon; Molecular weights; The hydrocarbons; Coal tar compounds; Flames, Fuel gases, Explosions; Thermochemistry; Carbohydrates; Alcohols, Organic acids and their derivatives; The phosphorus family; The silicon family and boron; Colloids; Metals; The alkali metals; The alkaline-earth metals; The magnesium family; The aluminum group; The silicate industries; The iron family; Copper; Mercury; Silver; Tin and lead; Manganese and chromium; The vanadium and molybdenum families; Radioactivity; Gold and the platinum family; Index; Appendix.

MADDOX, H. A. Paper: Its History, Sources and Manufacture. (Pitman's Common Commodities and Industries.) 159 p. 12 mo. il. 1919. $1.00

CONTENTS: History of paper manufacturing; The evolution of paper making; Cellulose and its compounds, The characteristics of fibers; Treatment of materials; Rags, Esparto straw; Manufacture of wood pulp; Soda recovery, Treatment in the beater, Beaters and refiners; Loading, sizing, coloring; The paper making machine, Hand-made paper, The various finishes imparted to paper; Coated paper; Testing.

MAHIN, E. G. Quantitative Analsyis. By Edward G. Mahin, Ph D., Professor of Analytical Chemistry, Purdue University. 510 p. 8 vo. il. 1914. $4.00

A textbook and teaching manual that is sufficiently full in its details to be of use to the analyst in practice It is broader in scope and fuller in treatment than the usual laboratory textbook.

MAIN DIVISIONS: Part I—General principles. Part II—Gravimetric analysis, Experimental gravimetric analysis; Electro-analysis Part III Volumetric analysis; Color changes of indicators; Standardization, Experimental volumetric analysis; Analysis of industrial products and raw materials.

MAKOWER, W., and GEIGER, H. G. Practical Measurements in Radio-Activity. By W. Makower, D Sc, Lecturer and Demonstrator in Physics; and H. G. Geiger, Ph D., Lecturer in Physics, University of Manchester. 161 p. 8 vo. il. 1912. $2.20

MANLOVE, G. H., and VICKERS, G. Scrap Metals; study of iron and steel old material, its preparation and markets, by G. H. Manlove; The Old Metals by G. Vickers. 278 p. 12 mo. 1918. $2.00

MANLY, HAROLD PHILLIPS. Oxy-acetylene Welding and Cutting, Electric, Forge and Thermit Welding; together with related methods and materials used in metal working, and the oxygen process for the removal of carbon. 215 p. 16 mo. il. 1916. $1.50

A practical handbook fairly well illustrated. Twenty-two pages are devoted to descriptions of metals and alloys, with brief references to annealing, hardening, tempering, and case hardening of steel. Over one hundred pages have to do with oxy-acetylene welding and the production and handling of the gases. Chapter six concerns the several methods of electric welding, and chapter seven tells about hand forging and welding. Chapter eight discusses soldering, brazing, and thermit welding, while chapter nine touches briefly on the oxygen process for the removal of carbon from gas-engine cylinders.

MARKS, LIONEL S. Mechanical Engineers' Handbook; based on the Hutte and prepared by a staff of specialists. 1836 p. 12 mo. il. 1916. $7.00

Comprises closely packed and conveniently arranged information by well known writers, each an expert in his field. Similar in character to the German Hutte, which it follows in the more theoretical sections, although changes have been made to meet American conditions. Those portions dealing with engineering practice are stated to be entirely new. Electrical and civil engineering are included to some extent and there are special sections devoted to aeronautics, automobiles, building construction, heating and ventilation, illumination, refrigeration, and railway engineering. Well provided with illustrations and bibliographical references. A mine of information for the engineer or the technical librarian.

MARSHALL, ALBERT E. The Fertilizer Industry. To be published by The Chemical Catalog Co., Inc. Ready about October 1, 1922.

MARSHALL, ARTHUR. Explosives. Second edition, revised and enlarged. 2 vols. 8 vo. il. 1917. $16.00

MARSON, PERCIVAL. Glass and Glass-making. (Pitman's Common Commodities and Industries.) 127 p. 12 mo. il. 1919. $1.00

CONTENTS: History; The chemistry of glass-making and the materials used; The chemical and physical properties of glass; The composition of the different kinds of glass; Colored glass and artificial gems; Decolorizers; The refractory materials used; Glass-house furnaces; Glass-melting pots and their manufacture; Lehrs and annealing; The manipulation of glass-makers' tools and machines; Crown, sheet and plate glass; Tube, cane and chemical glassware; Optical glassware; English and foreign methods of glass manufacturing compared.

MARTIN, F. W. A Laboratory Guide to Qualitative Analysis with the Blow-pipe. 47 p. 8 vo. **$0.60**

Presents tables for the determination of the various elements by the blow-pipe.

MARTIN, GEOFFREY. Industrial and Manufacturing Chemistry. 3 vols. 8 vo. 1920.
Organic. One vol. 744 p. il. **$12.00**
Inorganic. Two vols. Vol. 1, 496 p., Vol. 2, 482 p. Each, **$12.00**
The Set Three vols. **$36.00**

MARTIN, GEOFFREY. Modern Chemistry and Its Wonders. A popular account of some of the more remarkable recent advances in chemical science. 267 p. 12 mo. il. 1915 **$3.00**

CONTENTS: The wonderland of modern chemistry, The romance of some simple nitrogen compounds, The romance of explosives, Radium and the new chemistry, The mystery of the periodic law, The radio elements and the periodic law, Modern alchemy, Applications of electricity to chemistry, The romance of hydrocarbons, The romance of sugar, The romance of alcohol, The romance of common salt; Metallic firestones, Artificial precious stones.

The really wonderful achievements of modern scientific chemistry are popularly explained in this work.

MARTIN, GEOFFREY. Triumphs and Wonders of Modern Chemistry. A popular treatise on modern chemistry and its marvels, written in non-technical language for general readers and students 378 p. 8 vo. il. 1912 **$3.00**

CONTENTS. The mystery of matter The underwood of atoms Distribution and evolution of the elements. The wonders of chemical change. Water. The element hydrogen The air Oxygen, the life supporting element. The element nitrogen. The element carbon Carbon dioxide. Silicon and its compounds. Sulphur and its compounds The phosphorous group of elements. Fire, flame and spectral analysis.

MARTIN, GEOFFREY, and Others. Industrial Gases; including the liquefaction of gases and the manufacture of hydrogen, oxygen, nitrogen, carbon dioxide, sulphur dioxide, ammonia, producer gas, illuminating gas, acetylene, ozone, etc 150 p. 8 vo. il. 1916. **$4.00**

Large industries based upon new developments in the technology of gases—surprisingly large to the layman to whom these developments are new—have come into being during the past few years. Gaseous nitrogen has created the industry of cyanamide, so widely used as a fertilizer and as the basis of many other nitrogen compounds. Hydrogen has acquired importance in the hardening of fats and in aeronautics. The manufacture of synthetic ammonia from the atmosphere is commercially successful, and although the secrets of actual methods are carefully guarded, there is described in this book whatever has been made public

This work, the seventh of an important series on chemical technology, gives in concise form and from many scattered sources the present state of the art of each of the subjects cited in the subtitle It is clearly illustrated and the reference list on patent literature is stated to be as complete as possible

MARTIN, GEOFFREY, SMITH, STANLEY, and MILSOM, F. The Salt and Alkali Industry; including potassium salts and the Stassfurt industry. 112 p. 8 vo. il. 1916. **$3.00**

CONTENTS The salt industry; The manufacture of hydrochloric acid; The manufacture of sodium sulphate (saltcake), General survey of the sodium carbonate industry, The manufacture of the sodium carbonate and caustic soda by the Leblanc process, Manufacture of sodium carbonate by the ammonia soda process, The Stassfurt industry; Potassium salts.

MARTIN, GEOFFREY; and FOUCAR, J. L. Sulphuric Acid and Sulphur Products. 80 p. 4 to. 1916. **$4.00**

MARTINEAU, GEORGE. Sugar. Cane and Beet. (Pitman's Common Commodities and Industries.) 161 p. il. 12 mo. 1919. **$1.00**

CONTENTS. A retrospect, Cane and beet, Cane juice, Beet juice, Clarification, Crystallization, Sugar refining, The cane industry, The beet industry; Competition; Diplomacy, The sugar market

MASON, W. P. Examination of Water. (Chemical and Bacteriological.) By William P. Mason, Professor of Chemistry, Rensselaer Polytechnic Institute. Fifth edition, revised. 186 p. 12 mo. il. 1917. **$1.50**

Gives suggestions for the determination of mineral matters in water, and presents such material on the bacteriological examination as has been demonstrated to be of real service to the water examiner

MATHESON, EWING. Depreciation of Factories, Mines and Industrial Undertakings. 230 p. 12 mo. 1914. **$3.50**

MATHEWS, ALBERT P. Physiological Chemistry. A textbook and manual for students. Second revised edition. 1,055 p. 8 vo. il. 1916. **$4.50**

MATTHEWS, ERNEST R. Refuse Disposal. A practical manual for municipal engineers, members of local authorities, etc. 160 p. 12 mo. il. 1915. **$2.00**

CONTENTS: Collection of home refuse Unsatisfactory methods of disposal. Conversion into manure. Destruction by burning. Types of destructors. The Meldrum destructor. The Heenan destructor. Other types of destructors. The Dawson Manfield destructor Installation of villages, hospitals, etc. Use for the clinker. Chimney construction. Steel plate chimney construction. Principles of vacuum cleaning. Index.

MATTHEWS, F. E. Elementary Mechanical Refrigeration. By F. E. Matthews. B.S., M.E., E.E. 172 p.. 8 vo. il. 1912 **$2.50**

A straightforward treatise on the elements and principles of mechanical refrigeration for the man who is not a specialist, but needs concise working data. It is designed for the engineer, draftsman and layman who wants to understand the principles and their application.

CONTENTS: Part I.—I.—Cold and its production. II.—The development of mechanical refrigeration. III.—Commercial systems of refrigeration. IV.—Compression systems. V.—Simple comparisons. VI.—Ice-making systems. VII.—The installation and operation of refrigerating systems. VIII Working pressures. IX.—Cleaning the system. X.—Capacity of refrigerating machines. XI.—Cold storage duty.

MATTHEWS, J. MERRITT. Bleaching Technology. About 650 p. 8 vo. Nearly 300 il. 1921. **$8.00**

CONTENTS: Introduction, The wool fiber and its impurities; The scouring of wool; Machinery for wool scouring, By products in wool scouring, The bleaching of wool; The boiling-off of silk, The bleaching of silk, Boiling-out of cotton, Bleaching of cotton, Bleaching of cotton cloth, Bleaching of linen Bleaching of other vegetable fibers and materials, Stripping of dyed colors, Testing of materials used in bleaching, Materials used in bleaching

MATTHEWS, J. MERRITT. The Textile Fibers. Their physical, microscopical and chemical properties. By J. Merritt Matthews, Ph.D. Third edition, rewritten 630 p. 8 vo. il. 1913. **$5.00**

A systematic presentation of all the facts concerning textile fibers.

CONTENTS Classification Wool and hair fibers Shoddy and wool substitutes Minor hair fibers Origin and cultivation of the physical and chemical properties of silk Vegetable fibers Cotton. Chemical properties of cotton Mercerized cotton Minor seed hairs. Artificial silks. Linen Jute. Ramie Hemp Minor vegetable fibers. Analysis of the textile fibers. Textile fabrics and yarns

MATTHEWS, J. MERRITT. The Application of Dyestuffs. 768 p. 8 vo. 303 il. 1920 **$10.00**

CONTENTS Introduction, Chemical Study of the Fibers; Scouring the Textile Fibers, Bleaching of Wool and Silk, Bleaching of Cotton; Classification of Dyes, Application of Acid Dyes to Wool, Application of Acid Dyes to Silk, Cotton, etc., Representative Acid Dyes; Stripping of Colors, Testing Fastness of Dyes, Application of Basic Dyes, Basic Dyes on Cotton, Principal Basic Dyes, Application of Substantive Dyes to Cotton, Substantive Dyes on Wool and Silk; Developed Dyes on Cotton and Silk, Application of Mordant Dyes, Sulphur Dyes, The Vat Dyes, Aniline Black, Use of Logwood in Dyeing, The Minor Natural Dyes, The Mineral Dyestuffs, Dyeing of Fabrics Containing Mixed Fibers, Application of Dyes to Minor Vegetable Fibers, Linen, Ramie, Hemp, Jute, and Artificial Silk, Theory of Dyeing; Testing the Fastness of Colors, Application of Dyes to Various Materials, Application of Dyestuffs in the Preparation of Lakes Inks, etc., Testing of Dyestuffs, Miscellaneous Tests in Dyeing, Chemical Reactions of Dyestuffs; Analysis of Textile Fabrics, Useful Data for Dyers and Textile Chemists

MAUJER, AUSTIN R., and BROMLEY, C. H. Fuel Economy in Boiler Rooms; a development of "Fuel economy and CO₂ recorders" published in "Power." 308 p. 8 vo. il. 1918. **$3.00**

MAXTED, CHESTER C. Catalytic Hydrogenation and Reduction. 140 p. 12 mo. 1919. **$1.25**

MAXWELL, FRANCIS. Sulphitation in White Sugar Manufacture. 84 p. 8 vo. 1916. **$4.00**

CONTENTS: Sulphur and its compounds in the manufacture of sugar; Sulphate, Sulphurous acid, Generating plants and sulphitation vessels; Control of the sulphurous acid gas generating station; Analysis of gas; Action of acid on juices, Principles of the application of sulphitation to juice, Sulphitation of syrup and molasses, sulphitation process, Processes adopted, Summary.

MAXWELL, J. C. Matter and Motion. Reprinted with Notes and Appendices by Sir Joseph Larmor. 178 p. il. 12 mo. 1920. **$2.00**

CONTENTS Introduction, On motion, On force, On the properties of the center of mass of a material system, On work and energy. Recapitulation, The pendulum and gravity, Universal gravitation; On the equations of motion of a connected system, Appendix, The Relativity of the forces of nature, The principle of least action

MAY, P. The Chemistry of Synthetic Drugs. By Percy May, D.Sc. 250 p. 8 vo. 1918 **$4.25**

New drugs are constantly appearing on the market, and though well known and widely used, their chemical nature is often unknown even to chemists possessing a good knowledge of general organic chemistry The present volume is intended to supply this information, including the guiding principles which are used in the production of these drugs

MEAD, DANIEL WEBSTER. Water Power Engineering. The theory, investigation and development of water powers. Second edition. 843 p. 8 vo. il. 1915. **$6.00**

A complete revision Author is professor of hydraulic engineering in the University of Wisconsin Has supplementary chapters on well known plants, costs, financial and commercial considerations, operation and maintenance, with tables covering tests on standard turbines.

MEADE, ALWYNE. Modern Gasworks Practice. 529 p. 4 to. il. 1916. **$8.50**

Considers chiefly the British practice of planning and laying out of construction works and equipment, including the use of electricity and the mechanical handling of material There are also chapters on gas coal and its carbonization, the condensation of gas, exhausting machinery, gas purification, the recovery of cyanogen, and the manufacture and use of water gas

MEADE, R. K. Portland Cement. Its composition, raw materials, manufacture, testing and analysis. By Richard K. Meade. 512 p. 8 vo. il. 1911. **$5.00**

CONTENTS: Introduction Chapter I.—Relation between mortar materials and history of the development of the American Portland cement industry. Chapter II. The nature and composition of Portland cement. *Manufacture.* Chapter III.—Raw materials. Chapter IV.—Proportioning the raw materials Chapter V Quarrying, excavating, drying and mixing the raw materials Chapter VI.—Grinding the raw materials and grinding machinery Chapter VII.—Burning—kilns and process. Chapter VIII.—Burning (continued)—fuel and preparation of the same Chapter IX.—Cooling and grinding the clinker, storing and packing the cement, etc. *Analytical methods.* Chapter X.—The analysis of cement. Chapter XI.—The analysis of cement mixtures. Chapter XII.—Analysis of the raw materials. *Physical testing.* Chapter XIII.—The inspection of cement. Chapter XIV.—

Specific gravity. Chapter XV.—Fineness. Chapter XVI.—Time of setting. Chapter XVII.—Tensile strength. Chapter XVIII.—Soundness. *Miscellaneous.* Chapter XIX.—The detection of adulteration in Portland cement. Chapter XX.—The investigation of materials for the manufacturing of Portland cement. Appendix—tables.

MEADE, RICHARD K. The Chemist's Pocket Manual. Third edition. A practical handbook containing tables, formulas, calculations, information, physical and analytical methods for the use of chemists, chemical engineers, assayers, metallurgists, manufacturers and students. By Richard K. Meade, M.S. 530 p. 16 mo. 1918. **$4.00**

MEDICUS, LUDWIG. A Brief Introduction to Qualitative Analysis. Eighth edition. Translated by John Marshall. 215 p. 8 vo. il. 1913. **$2.25**

CONTENTS: Introduction. Properties of the bases. Properties of the acids. Preliminary examination. Solution and fusion. Detection of the bases in the wet way. Examination of acids. Appendix. Behavior of the compounds of the rare elements. Examples for practice in testing for the rare elements. Index.

MEES, C. E. KENNETH. Organization of Industrial Scientific Research. 175 p. 8 vo. 1920. **$2.00**

CONTENTS: I. Introduction. II.—Types of Research Laboratories. III. Co-operative Laboratories. IV.—The Position of the Research Laboratory in an Industrial Organization. V. The Internal Organization of Industrial Research Laboratories. VI. The Staff of a Research Laboratory. VII. The Building and Equipment of the Laboratory. VIII. The Direction of the Work. IX.—The Design of a Research Laboratory for a Specific Industry.

MEGRAW, H. A. Details of Cyanide Practice. 215 p. 8 vo. 1914. **$2.00**

CONTENTS: Preface. I.—The cobalt district, Ontario. II and III.—The Nipissing high grade mill, Cobalt. IV.—The Hollinger mill, Porcupine, Ontario. V.—The Dome mill, South Porcupine, Ontario. VI.—Practice in the Black Hills, South Dakota. VII.—The Liberty Bell mill, Telluride, Colorado. VIII.—Practice at Cripple Creek, Colorado. IX.—Continuous decantation of slime. X, XI and XII.—Practice at Tonopah. XIII.—The Nevada Hills mill at Fairview. XIV.—Practice at the Nevada Wonder Mill. XV.—Methods at Republic. XVI.—The mills of Grass Valley, California. XVII.—The Black Oak plant, California. XVIII.—The Gold Road Mill, Arizona. XIX.—Two Arizona mills. Index.

MEGRAW, H. A. The Flotation Process. Second edition, revised and enlarged. 359 p. 8 vo. il. 1918. **$4.00**

CHAPTER HEADINGS: I.—Concentration by flotation. II.—The patent record of flotation. III.—The theory of flotation. IV.—Oils and their uses. V.—Flotation processes and apparatus. VI.—Testing ores for flotation. VII.—Testing at the Anaconda mill. VIII.—The applications of flotation. IX.—Examples of flotation practice. X. Flotation operating plants. XI.—Flotation concentration at Anaconda. XII.—Flotation in practice. XIII.—The practice of flotation. XIV.—The place of flotation in metallurgy.

MEGSON, J. E., and JONES, H. S. The Diesel Engine in Practice, by J. E. Megson and H. S. Jones. 136 p. 16 mo. il. 1916. **$2.00**

Based, it is stated, upon many years of practical experience, this pocket sized manual is dedicated to the purchaser and his engineer. Sketches briefly the history of the engine and its mode of working. There are chapters on fuel, the effect of altitude, operation and care, life and reliability, description of modern engines (chiefly American), economics, and the application to marine purposes.

MELDOLA, R. The Chemical Synthesis of Vital Products and the Interrelation between Organic Compounds. By Raphael Meldola, F.R.S., Professor of Chemistry, City and Guilds of London Technical College. Vol. I., 355 p. 8 vo. 1904. **$6.75**

MELLOR, J. W. Clay and Pottery Industries. Being volume I of the collected papers from the County Pottery Laboratory, Staffordshire. 411 p. 8 vo. il. 1914. **$6.00**

No industry calls so obviously for the application of science as the manufacture of pottery. Within this volume are papers describing the results of important investigations in every field of the industry as they were carried out at the Staffordshire Pottery School in a thriving pottery district in England.

MELLOR, J. W. Higher Mathematics for Students of Chemistry and Physics. By J. W. Mellor, D.Sc. Fourth edition, enlarged. 662 p. 8 vo. il. 1913. **$7.00**

Professor Mellor in the present volume attempts to show the relations which the pure abstractions of calculus, differential equations, etc., bear to the problems of the sciences. He discusses each of these branches of mathematics, presupposing a previous knowledge of algebra and trigonometry, and brings out their inner meaning by constant reference to analogous operations in the physical sciences.

MELLOR, J. W. Introduction to Modern Inorganic Chemistry. By J. W. Mellor, D.Sc. New edition. 700 p. 8 vo. 1914. **$2.75**

An abridgment of the author's "Modern Inorganic Chemistry" (see below) in a simpler dress, which has been adapted to suit beginners' classes in chemistry. It retains all the admirable features of the larger book.

MELLOR, J. W. Modern Inorganic Chemistry. By J. W. Mellor. New edition. 928 p. 8 vo. il. 1912. **$4.00**

This book is written from the modern standpoint, and the more recently established principles of physical chemistry have been woven with the facts generally taught in college courses. The historical method has been followed wherever possible and the whole subject developed in its most logical teaching order.

MELLOR, J. W. A Treatise on Quantitative Inorganic Analysis. With special reference to the analysis of clays, silicates, and related minerals. 788 p. 8 vo. il. 1913. **$9.00**
Vol. I of a Treatise on the Ceramic Industries.

CONTENTS: Part I.—General—introduction. Weighing and measurement of volumes. Volumetric analysis. Colorimetry and turbidimetry. Filtration and washing. Heating and drying. Pulverisation and grinding. Sampling. The reagents. Part II.—Typical silicate analyses. Clays—The determination of volatile matters. Opening up silicates. The determination of silica. The ammonia precipitate. The determination of iron. The determination of titanium. The determination of calcium and magnesium. The determination of alkalies. Abbreviated analyses and analytical errors. Electro-analysis. Part III.—Analysis of glasses, glazes, colours and complex silicates. The analysis of glass, glazes, enamels, and colours. The determination of arsenic. The determination of antimony. The determination of tin. The determination of lead. The determination of bismuth and mercury. The determination of copper and cadmium. The determination of zinc. The determination of manganese. The determination of cobalt and nickel. Part IV.—Special methods. Bases—The determination of molybdenum, tungsten, columbium, and tantalum. The determination of gold and selenium. The determination of aluminium and beryllium. Special methods for iron compounds. The determination of chromium, vanadium, and uranium. The determination of zirconium, thorium, and the rare earths. Special methods for the determination of barium, strontium, calcium, and magnesium. Special methods for the determination of alkalies and their salts. Part V. Special methods—acids and non metals—The determination of carbon, free and combined. The determination of water. The determination of boron oxide. The determination of phosphorus. The determination of sulphur. The determination of the halogens. The rational analysis of clays. Appendix. Tables. The library. Index of names. Index of subjects.

MENDELEEFF, D. The Principles of Chemistry. By D. Mendeléeff. Translated from the seventh Russion edition by George Kamensky, A.R.S.M., of St. Petersburg, and edited by Thomas H. Pope, B.Sc., F.I.C. Third English edition. 2 vols. 8 vo. 1905. Vol. I, 662 p.; Vol. II, 559 p. Per set **$10.50**

The third edition of this standard work contains not only numerous additions to fact such as the liquefaction of gases, the rare atmospheric elements, the subject of radioactivity, etc., but as well complete revisions of the theoretical portion. The work is specially intended to give an insight into the unchangeable substratum underlying the varying forms of matter.

MERRILL, G. P. The Non-Metallic Minerals. By George P. Merrill. Second edition, revised. 432 p. 8 vo. 1910. **$5.00**

Collects notes relating to minor minerals and non-metallic compounds of a mineral nature. Includes cements, coals, phosphates, etc.

CONTENTS: The elements. Sulphides and arsenides. Halides. Oxides. Carbonate. Silicates. Niobates, tantalates, and tungstates. Phosphates and vanadates. Nitrates. Borates. Uranates. Sulphates. Hydrocarbon compounds. Miscellaneous.

MERRIMAN, M. American Civil Engineers' Handbook. By Mansfield Merriman, Editor-in-Chief, and fifteen associate editors. Fourth edition, enlarged. 1955 p. 16 mo. il. 1920. Flexible binding. **$7.00**

A book prepared upon practical principles selecting those topics to which civil engineers most frequently desire to refer, condensing the matter so that the greatest amount may be put in the assigned space, and at the same time, be clearly presented.

MIERZINSKI, S. The Waterproofing of Fabrics. Translated from the German by Arthur Morris and Herbert Robson. Third edition, revised and enlarged. 140 p. 12 mo. 1920. **$2.50**

CONTENTS: Definition; Preliminary treatment of the fabric; Waterproofing with acetate of alumina; Impregnation of the fabric; Drying. Waterproofing with paraffin wax, ammonium cuprate and insoluble soaps of metallic oxides; Dyeing waterproof fabrics; Waterproofing with gelatine, tannin, caseinate of lime and other bodies; Manufacture of tarpaulin; British waterproofing patents.

MILLAR, A. Wheat; from the grower to the consumer. 140 p. 12 mo. 1916. **$1.00**

MILLARD, E. B. Physical Chemistry for Colleges. By E. B. Millard, Assistant Professor of Physical Chemistry, Massachusetts Institute of Technology. 416 p. 8 vo. **$3.50**

A textbook on the more important aspects of physical chemistry, together with accurate modern data which illustrate the applicability of its laws to the phenomena observed in the laboratory.

CONTENTS: I. Determination of atomic weights. II. Laws of gases. III. Liquid substances. IV. Solids. V. Solutions—Ideal solutions. VI. Ionized solutes. Electrical conductivity. VII. Thermochemistry. VIII. Homogeneous chemical equilibrium. IX. Heterogeneous chemical equilibrium. X. Velocity of chemical reactions. XI. Physical properties and chemical structure. XII. The periodic law. XIII. Radiochemistry and radioactivity. XIV. Atomic structure. XV. Surface chemistry colloids. XVI. Electrochemistry; electromotive force.

MILLIKAN, ROBERT ANDREWS. The Electron; its isolation and measurement and the determination of some of its properties. 268 p. 8 vo. il. 1917. **$1.75**

"The purpose of this volume is to present the evidence for the atomic structure of electricity, to describe some of the most significant properties of the elementary electrical unit, the electron, and to discuss the bearing of these properties upon the two most important problems of modern physics: the structure of the atom and the nature of electromagnetic radiation." Since the book is intended for the general reader as well as for the physicist all mathematical tables have been placed in appendices.

MINERAL INDUSTRY, The. Vol. XXVIII. 1919. Edited by G. A. Roush, Assistant Professor of Metallurgy, Lehigh University. 1000 p. 8 vo. il. 1920. **$10.00**

The latest technology in all fields and the statistics of production of all commercially important minerals made available many months ahead of other sources. It is the indispensable tool of every metallurgist, mining engineer and chemist. It is an exhaustive review, not only of a statistical but a general nature. Every article is the work of a specialist. Every commercially valuable metal from aluminum to zinc is covered in alphabetical order fully and authoritatively.

MITCHELL, C. A. Edible Oils and Fats. 156 p. 8 vo. il. 1918. **$2.50**

CONTENTS: The nature, composition and properties of fats. Constituents of oils and fats. Extraction and purification. Methods of examination. Characteristics of individual oils and fats. Butter and butter fat. Hardened or hydrogenated oils. Manufacture of margarine. Bibliography. Indexes.

MITCHELL, CHARLES AINSWORTH. Flesh Foods. A practical handbook for medical men, analysts, inspectors, and others. 336 p. 12 mo. il. 1900. $3.50

CONTENTS: Structure and chemical composition of muscular fiber. Structure and composition of connective tissue and blood. The flesh of different animals. The examination of flesh. Methods of examining animal fat. The preservation of flesh and the composition and examination of preserved flesh products. The composition and analysis of sausages. The proteids of flesh. Meat extracts and flesh peptones. The cooking of flesh. Poisonous flesh. The animal parasites of flesh. The bacteriological examination of flesh. The extraction and separation of ptomaines. Index.

MITCHELL, C. AINSWORTH. Oils: Animal, Vegetable, Essential, and Mineral. (Pitman's Common Commodities and Industries.) 138 p. il. 12 mo. 1920. $1.00

CONTENTS: Part I. Fixed oils, fats, waxes, vegetable oils, non drying oils, Semi-drying oils, Drying oils, Vegetable oils, Solid fats, Butter, Animal oils; Fish oils, Marine animal oils, Waxes. Part II. Essential oils, Volatile oils used in perfumery, Volatile oils used as flavoring agents, Volatile oils used as solvents. Part III. Mineral oils. Appendix—The trade in oil.

MITCHELL, C. AINSWORTH. Vinegar: Its Manufacture and Examination. 201 p. 8 vo. il. 1916. $3.50

Deals with English practice and "endeavors to make clear the scientific principles underlying each stage of the manufacture, and to indicate the lines upon which the development of the industry is possible." Chapter I tells in an interesting way about the history of the art.

CONTENTS. Historical introduction. Theories of acetic fermentation. The acetic bacteria. Chemical reactions in acetification. Acetic acid. Preparation of the gyle. Acetification of the gyle. Treatment of the crude vinegar. Method of examination. Characteristics of different vinegars. Appendix I—Import duties on vinegar and acetic acid. Appendix II—French duties on vinegar. Index.

MITCHELL, CHARLES AINSWORTH, and HEPWORTH, T. C. Inks; their composition and manufacture, including methods of examination and a full list of English patents. Second edition, revised. 266 p. 12 mo. il. 1916. $3.00

CONTENTS: Historical introduction. Section I. Writing inks. Carbon and carbonaceous inks. Tannin materials for inks. Nature of inks. Manufacture of iron gall inks. Logwood, vanadium, and aniline black inks. Coloured writing inks. Examination of writings. Section II—Printing inks. Early methods of manufacture. Manufacture of varnish. Preparation and incorporation of the pigment. Coloured printing inks. Section III. Inks for miscellaneous purposes. Copying inks. Marking inks. Safety inks and papers. Sympathetic inks. Inks for special purposes. List of English patents. Index.

MITCHELL, C. A., and PRIDEAUX, R. M. Fibers Used in Textile and Allied Industries. 208 p. 8 vo. il. 1910. $3.50

CONTENTS. Introduction. Wool. Vicuna. Camel hair. Alpaca. Llama hair. Mohair. Cashmere. Goats' hair. Cow hair. Horse hair. Deer hair, reindeer hair, rabbits' hair. Cats' hair. Dogs' hair. Kangaroo's hair. Human hair. Silk. Cotton. Mercerized cotton. Artificial silks. Linen. Flax wax. Ramie. Jute. Hemp. Sisal hemp. Pita fiber. Manila hemp. Musa paradisiaca fiber. Banana fiber. Andasonia fiber. Sanseviera fiber. Sunn hemp. Gambo hemp. New Zealand flax. Mauritius hemp. Yercum fiber. Pineapple fiber. Brush fibers. Vegetable downs and upholstery fibers.

MITCHELL, CHARLES A. Mineral and Aerated Waters. 227 p. 8 vo. 1913. $3.00

CONTENTS. Origin and Properties of Natural Mineral Waters. Gases in Natural Waters. Holy Wells. The Zem Zem Well at Mecca. Spas and Their Springs. Natural Mineral Table Waters. Thermal Springs and Radio-Activity, Temperatures. Helium and Niton in Mineral Waters. Measurement of Radio-Activity. Artificial Radio-Active Mineral Waters. Carbon Dioxide, Its Preparation. Properties and Uses in the Mineral Water Factory. Artificial Mineral Waters. Early Forms of Carbonating Waters. The Machinery of To-Day. Arrangement of a Soda Water Factory. Bottles and Bottling Machinery. Making of Ginger Beer. Examination of Mineral Waters. Bibliography.

An outline of the early methods of making artificial mineral waters leading up to a description of the apparatus of the modern carbonating plant. Gives much information concerning many of the European Spas and their springs, together with analyses of their waters.

MOELLER-KRAUSE, W. Practical Handbook for Beet-Sugar Chemists. By Werner Moeller-Krause, Sugar Chemist. 132 p. 8 vo. il. 1914. $1.50

CONTENTS: Chapter I.—Sugars. Chapter II.—The polariscope. Chapter III.—Short outline of the manufacture of sugar and of the methods to desugarize molasses. Chapter IV.—The analysis of sugar beets. Chapter V.—The analysis of beet and thin juices. Chapter VI.—The analysis of massecuites, molasses, thick juices and sirups. Chapter VII.—The analysis of sugars. Chapter VIII.—The analysis of pulp, waste water, limecakes and condensed water. Chapter IX.—The analysis of saccharates. Chapter X.—Miscellaneous notes. Chapter XI.—The analysis of water. Chapter XII.—The analysis of limestone. Chapter XIII.—The analysis of limekiln and chimney gases. Chapter XIV.—The analysis of coal and coke. Chapter XV.—The preparation of solutions, standard acids, etc. Chapter XVI.—Tables.

MOISSAN, H. The Electric Furnace. By Henri Moissan. Authorized translation by Victor Lenher, Ph. D., University of Wisconsin. 305 p. 8 vo. il. 1904. $3.50

CONTENTS: I.—Description of the different models of electric furnaces. II.—Various modifications of carbon. III.—Preparation of some simple substances in the electric furnace. IV.—Carbides, silicides, borides, phosphides, arsenides, and sulphides.

MOLDENKE, RICHARD. Principles of Iron Founding. 517 p. 8 vo. 1917. $5.00

Authoritative treatise by an eminent iron metallurgist on the underlying principles of the art of iron founding. Does not enter into the details of general foundry practice, which are to be taken up in a companion volume to be published later. The present volume contains chapters on the outlines of iron metallurgy and iron-making processes, properties of cast iron, classification of castings, foundry raw materials, technology of combustion, melting processes, mixture-making, testing cast iron, etc.

Glossary of terms, pp. 459-463.

MOLESWORTH, G. L. Metric Tables. 104 p. 32 mo. 1917. $1.00

MOLINARI, E. General and Industrial Inorganic Chemistry. By Ettore Molinari, Professor of Industrial Chemistry to the Society for the Encouragement of Arts and Manufactures and of Merceology of the Luigi Bocconi Commercial University in Milan. From the fourth Italian edition, carefully revised and brought up to date. 876 p. 8 vo. il. 1920. $12.00

MOOR, CRESACRE GEORGE, and PARTRIDGE, WILLIAM. Aids to the Analysis of Food and Drugs. Fourth edition. 279 p. 16 mo. 1918. $1.50

MOORE, A. S. Linen: From the Raw Material to the Finished Product. (Pitman's Common Commodities and Industries.) 132 p. il. 12 mo. 1918. $1.00

CONTENTS: Linen in history, Foundation of Irish linen trade; The Irish Linen Board, The linen riots, Linen outside Ulster; Old linen markets, English linen trade; Scotch linen trade; Linen bounties, Evils of bounties, Factory system introduced, Royal Flax Society, Irish linen trade as it is, Wages and Employment, What the output means; Destination of linen manufactures, Foreign linen manufactures; The raw material, Flax growing; Flax growing in Russia; Preparing the flax; Process of retting; Process of scutching or cleaning; Imports of Flax and tow, The spinning mill, Fluctuations of fortune; Hackling; The Spreader and sliver, Measuring the yarn; Linen yarn exports; Winding, warping and weaving, The Jacquard loom; Hand loom weaving; Bleaching and finishing, Finishing; Printing and dyeing; Varieties of linen, Linen cambrics; Making of Unions, Cotton, a fierce competitor; How to distinguish linen, Grading of linen; How to reckon fineness, Some technical names, The testing house; Making up and marketing; Market distribution; Conditions of work; A generous action; Healthful improvements; Technical education; Combination and wages; Workers' trade unions; Masters' associations.

MOORE, FORRIS JEWETT. A History of Chemistry. 292 p. 12 mo. 1918. $2.50

CONTENTS. I.—Chemistry among the ancients. II.—Chemistry in the middle ages alchemy. III. Chemistry in the Renaissance. IV. Boyle and his contemporaries. The Phlogiston theory. V.—The later Phlogistians—The discovery of oxygen. VI. Lavoisier. VII.—The law of definite proportions. VIII. Dalton and the atomic theory. IX.—The early history of galvanic electricity. X. Humphry Davy. XI.—Berzelius the organizer of the science. XII.—Dualism in organic chemistry. XIII. The reaction against Berzelius. XIV. Gerhardt and the chemical reformation. Williamson. XV.—The transition from the type theory to the valence theory. XVI.—The periodic law. XVII. Bunsen, Berthelot and Pasteur. XVIII. Organic chemistry since 1860. XIX. Inorganic chemistry since 1860. XX.—The rise of physical chemistry. XXI. Radioactivity—its influence upon the atomic theory.

MOORE, F. J. Experiments in Organic Chemistry. 29 p. 8 vo. 1915. $0.75

Designed as a Laboratory Manual to accompany "Outlines of Organic Chemistry."

MOORE, F. J. Outlines of Organic Chemistry. Second edition, rewritten. 325 p. 15 figures. 8 vo. 1914. $2.50

Covers substances which have a wide technical application, like acetylene or linseed oil, those which are important factors in vital processes like glycogen or urea, those which are familiar in everyday life, like sugar or starch, and those which throw light on some important theory. Covers alcohols, acids, aldehydes, carbohydrates, amino-acids and proteids, aromatic nitrogen compounds, dyes, etc.

MOORE, HAROLD. Liquid Fuels for Internal Combustion Engines. A practical treatise for engineers and chemists. 215 p. 8 vo. il. 1918. $5.00

CONTENTS: Petroleum, Shale oil and its products; Coal tars and their products; Lignite tars and their products; Production of the carbonization of wood and peat, Animal and vegetable oils; Methyl and ethyl alcohol; fuels for engines fitted with carburetters; fuels for engines fitted with vaporizers, Fuel oils for engines fitted with atomizers, The examination of liquid fuels, Calorimetry.

MOORE, H. F. Textbook of the Materials of Engineering. By Herbert F. Moore, Research Professor of Engineering Materials, Engineering Experiment Station, University of Illinois. 204 p. 8 vo. il. 1917. $3.00

A concise, elementary presentation of the physical properties of the common materials used in structures and machines. It presents also brief descriptions of their manufacture and fabrication. Though primarily a textbook for a fundamental college course, it should prove of value also to draftsmen, inspectors, machinists, and others who deal with the materials of engineering.

MORGAN, G. T. Organic Compounds of Arsenic and Antimony. 375 p. 8 vo. 1918. $5.50

CONTENTS: Preface. Introduction. Cacodyl. Aliphatic arsenicals and antimonials. Aromatic arsenicals. Atoxyl. Salvarsan. Neo-salvarsan. Aromatic primary arsines. Luargol. Aromatic antimonials. Miscellaneous derivatives. Appendix. Bibliography. Indexes.

MORGAN J. J. Blast Furnace Practice. 46 p. 12 mo. il. 1913. $0.75

CONTENTS: Requirements. Iron ores. Fuel. Flux. Slags. Quantity of slag. Burden; Charge; Round. The blast. Ore mixing. Amount and composition of the iron. Calculation of flux. Heating the blast. Stoves: Drying, heating, changing, and cleaning. Drying the furnace. Filling the furnace, and lighting. Charging the furnace. Descent of the charge. Flushing. Tapping. Hard tapping hole. Running down the beds (casting). Judging the temperature. Controlling the temperature. Temperature and the reduction of silicon. The pig iron. Fuel consumption. Tuyères: Leaky, changing. Cooler, or "Jumbo." Damping down. Blowing out. Index.

MORGAN, J. J. Tables for Quantitative Metallurgical Analysis. For laboratory use. 8 vo. 1899. $1.75

CONTENTS: Iron ores. Steel. Limestone, boiler incrustation. Blast furnace slag. Coal. Water for technical purposes. Gaseous fuels. Chimney gas. Copper. Zinc. Lead. Alloys. White lead. Atomic weights. Factors. Preparation of equivalent reagents.

MORGAN, J. LIVINGSTON R. Physical Chemistry for Electrical Engineers. Second edition, revised. 249 p. 8 vo. $3.00

Presents the generalizations which form the basis of the applications of electricity to the chemical sciences and the electrical applications of chemistry. Discusses fundamental principles, general properties of gases, chemical mechanics, electrochemistry, equilibrium in electrolytes, etc.

MORRISON, LACEY H. Oil Engines, Details and Operation. 472 p. 8 vo. il. 1919. $5.00

A modern book on the construction and operation of oil engines. Much of the matter included cannot be obtained elsewhere in book form.

MORROW, A. S. Immediate Care of the Injured. By Major Albert S. Morrow, M.D. New edition. 362 p. 12 mo. il. 1918. $2.75

MORSE, I. H. Calculations Used in Cane-Sugar Factories. A practical system of chemical control for Louisiana sugar-houses and other cane-producing countries. By Irving H Morse, B.S. Second edition, rewritten. 189 p. 16 mo. 1917. Flexible "Fabrikoid" binding. $2.00

Contains a practical system of chemical control for cane sugar factories, written for chemists and assistants.

CONTENTS: The sampling and analysis of the sugar products. The formula for available sugar mill control. Calculations used in the manufacturing processes. Stock on hand calculations. Laboratory reports. The calculated commercial yield per ton of cane Manufacturing economics. The purchase of cane by the "unit" method.

MORTIMER, G. Aluminum. (Pitman's Common Commodities and Industries.) 152 p. 12 mo. il. 1920. $1.00

CONTENTS: Part I - From Clay to Consumer. Historical, Distribution, Production, Alloys of aluminum and their treatment, Hints on working with aluminum Part II - Applications In automobiles and aircraft; In the chemical industry and Aluminothermics, Electrical. Appendix—A brief note on marketing.

MOSES, ALFRED J., and PARSONS, CHARLES L. Elements of Mineralogy, Crystallography and Blowpipe Analysis. From a practical standpoint Fifth edition, revised and enlarged. 631 p. 8 vo. il. 1916. $4.50

CONTENTS: *Crystallography.* Introductory, The "Systems," Their Classes, Forms and Symbols; The Grouping of Crystals and Their Imperfections; The Determination of the Geometrical Constants of a Crystal; Crystals-Optics *Blowpipe Analysis.* Apparatus Blast, Flame, etc ; Operations of Blowpipe Analysis; Summary of Useful Tests with the Blowpipe; Schemes for Qualitative Blowpipe Analysis. *Mineralogy.* Definition and Physical Characters; The Chemical Characters of Minerals; Formation and Occurrence; The Minerals of the Metalliferous Ore Deposits; Minerals Important in the Industries and Not Already Described; Silica and the Rock forming Silicates, Minerals Used as Precious and Ornamental Stones *Determinative Mineralogy.* Tables for the Rapid Determination of the Common Minerals, Table of Atomic Weights.

MUIR, M. M. PATTISON. A History of Chemical Theories and Laws. 567 p. 8 vo. 1906. $4.00

Sets forth the main lines along which the science of chemistry has advanced, and describes the investigations which have given powerful impulses to the advance of chemical science.

MULLIKEN, S. P. A Method for the Identification of Pure Organic Compounds by a Systematic Analytical Procedure Based on Physical Properties and Chemical Reactions. In three volumes. By Samuel P. Mullikan, Ph D, Associate Professor of Organic Chemical Research, Massachusetts Institute of Technology. 1904-1916.

Vol. I. Compounds of carbon with hydrogen and oxygen. 264 p. 8 vo. $5.00

Contains classified description of about 2300 of the more important compounds of carbon with hydrogen and with hydrogen and oxygen.

CONTENTS: Classification of compounds and the general analytical procedure Ordinal tests (for the elements). The numbered generic and specific tests and analytical tables for the identification of species of the nine genera of colorless compounds constituting sub-order I of order I, these genera containing respectively· Aldehydes; Carbohydrates; Acids, phenolic compounds; Esters; Acid anhydrides and lactones; Ketones, Alcohols; Hydrocarbons, etc. Identification of the colored compounds of order I Special methods.

Vol. II. Nitrogenous compounds. 327 p. 8 vo. $5.00

Contains classified descriptions of about 6,000 of the more important compounds of carbon with nitrogen, hydrogen and oxygen.

CONTENTS: Classification and general analytical procedure Generic tests of suborder I. Order II Numbered tests of order II. Analytical tables and specific characterizations of the compounds of order II.—[(Compounds containing C, N, (H), (O).] Suborder I, Genus I—Colorless acidic compounds; Division A (solid species). Suborder I, Genus II.—Colorless basic compounds, suborder I, Genus III.—Colorless neutral compounds. Suborder II, colored compounds.

Vol. III. Commercial dyestuffs. Permanently out of print.

MUNBY, ALAN E. Introduction to the Chemistry and Physics of Building Materials. 365 p. 8 vo. il. 1009. $2.50

CONTENTS: Elementary Science: Natural Laws and Scientific Investigations; Measurement and the Properties of Matter; Air and Combustion. Nature and Measurements of Heat and Its Effects on Materials. Chemical Signs and Calculations Water and Its Impurities. Sulphur and the Nature of Acids and Bases. Coal and Its Products. Outlines of Geology Building Materials. The Constituents of Stones. Clays and Cementing Materials. Classification Examination and Testing of Stones. Brick and Other Clays. Kiln reactions and the Properties of Burnt Clays. Plasters and Limes Cements. Theories upon the Setting of Plasters and Hydraulic Materials. Artificial Stone. Oxychloride Cement. Asphalate. General Properties of Metals. Iron and Steel. Other Metals and Alloys. Timber. Paints, Oils, Thinners and Varnishes; Bases, Pigments and Driers.

MUNRO, R. D. Steam Boilers: Their Defects, Management, and Construction. Fifth edition. 157 p. 8 vo. il. $1.50

CONTENTS: Introductory. Explosions caused by overheating of plates. Shortness of water. Deposit. Explosions caused by defective and overloaded safety valves. Area of safety valves. Explosion caused by corrosion. A.—Internal corrosion. B.—External corrosion. Explosions caused by defective design and construction. 1.—Unsupported flue tubes. Collapsing pressures. 2.—Unstrengthened man-holes. 3.—Defective staying. 4—Bursting pressures of cylindrical boilers. 5.—Strength of riveted joints (iron). 6—Factor of safety. Specification of a Lancashire boiler for a working pressure of eighty pounds per inch. Mountings and fittings. Vertical boilers—Introductory; Construction; Construction of Shells; Construction of crown plates and uptake tubes (proportion of); Construction of man-holes, mud-holes, and fire holes; Construction of fireboxes; Mountings; Management; Cleaning. Table of bursting pressures of steel boilers. Table of riveted joints. Specification and drawing of Lancashire boiler for a working pressure of two hundred pounds per square inch. Index.

MURDOCH, JOSEPH. Microscopical Determination of the Opaque Minerals; an aid to the study of ores. 165 p. 8 vo. 1916. $2.00

MURKE, FRANZ. Manufacture of Beet Sugar. 175 p. 8 vo. 1921. $2.50

The brevity and conciseness with which the main principles of the beet sugar industry are touched upon and treated by the author make this book a valuable addition to the working library of superintendents, engineers and foremen engaged in this field, which is annually increasing in importance.

CONTENTS: Harvesting, storing and receiving beets; Fluming, washing and weighing of beets; Cutting of beets; Diffusion process; Pulp; Diffusion juice, First carbonation, Filter presses, After-purification; Evaporation, Thick juice saturation and filtration, First fillmass and remelt sugars; Further operations with the first fillmass; After product operations; Lime kiln, Steffens separation; Osmose process; Boiler house, Miscellaneous; Tables for various calculations

MURRAY, B. L. Standards and Tests for Reagent Chemicals. 395 p. 8 vo. 1919. $3.00

A new text filled with the latest and most trustworthy standards of purity for chemicals used in research, analytical, and control laboratories. The following points are covered quite systematically: Name and Common Synooyms, Chemical Formulas, Molecular Weight, Physical Properties, such as Color, Odor, Form, Melting Point, Boiling Point, Congealing Point, Specific Gravity, Solubility and Reaction; Standard of Purity; Uses as a Reagent; Storage and Precautions; Tabular Statement of Maximum of Allowable Impurities; Methods of Testing; Quantitative Methods; References to Literature.

MURRAY, J. A. Chemistry of Cattle Feeding and Dairying. 343 p. 8 vo. 1915. $2.50

MYERS, J. E., and FIRTH, J. B. Elementary Practical Chemistry; for medical students and others. 194 p. 12 mo. il. 1915. $1.25

A little handbook for use in first year chemistry, or as a help to the man who wishes to brush up on the subject in order to pass an examination.

NAYLOR, W. Trades Waste: Its Treatment and Utilization; with special reference to the prevention of rivers' pollution. 283 p. 8 vo. il. 1912. $7.50

This treatise aims at setting forth the causes of rivers' pollution and also the best known practical means of economical prevention. The utilization of trades waste, except where rivers' pollution is concerned, is only touched upon, as to do more would require a special volume This is intended as a handbook for borough engineers, surveyors, architects and analysts.

CONTENTS: Introduction. Chemical engineering. Woollen mill wastes. Tanning and fellmongery. Brewery and distillery waste. Calico bleaching and dyeing. Calico printing and dyeing. Paper-making waste. General chemical waste. Index.

NEALE, R. E. Electricity. (Pitman's Common Commodities and Industries.) 136 p. il. 1920. $1.00

CONTENTS· Source of electricity; Kinds of current; How electricity is measured and sold, Generating electricity in practice; Transmitting and distributing electricity; Switchgear and sub-stations, Primary and secondary cells; Electricity in homes and industries; Electric lamps and lighting; Electric heating and cooking; Electric motors and their applications, Electric traction; Conveyors; Hoists and Haulages; Electro-chemistry and electric furnaces; Electric welding and cutting; Telegraphy and telephony; Electricity in medicine and hygiene.

NERNST, WALTHER. Experimental and Theoretical Applications of Thermodynamics to Chemistry. By Dr. Walther Nernst, Professor and Director of the Institute of Physical Chemistry in the University of Berlin. 123 p. 12 mo. 1907. $1.50

NEAVE, G. B., and HEILBRON, I. M. The Identification of Organic Compounds. 111 p. 8 vo. 1916. $1.50

CONTENTS: Preliminary Tests. Tests for the Elements. Group Reactions. Hydrocarbons Alcohols. Ethers. Phenols. Aldehydes. Ketones. Acids. Aromatic Sulphonic Acids. Acid Anhydrides. Acid Halides. Acid Amides. Acid Imides. Acid Anilides. Esters. Quinones. Carbohydrates. Glucosides Amines. Nitro Compounds. Nitroso Compounds. Nitriles and Isonitriles. Isocyanates. Ureas and Ureides. Uric Acid Group. Halogen Compounds. Azo Compounds. Pyridine and Quinoline Group. Alkaloids. Sulphur Compounds. Terpenes and Allied Compounds. Albumens and Proteids. Appendix.

NERNST, W. Theoretical Chemistry from the Standpoint of Avogadro's Rule and Thermodynamics. By Prof. Walther Nernst, Ph.D., of the University of Berlin. Revised in accordance with the seventh German edition. Fourth English edition. 853 p. 8 vo. 1917. $6.00

A statement of guiding ideas which gives instruction to the student and advice to the investigator who seeks to prosecute his researches in the light of the more recent chemical theories. The author describes thoroughly only those experimental data which possess a

universal significance or which give promise of achieving it; only those hypotheses which have already proved themselves to be helpful; and finally only those applications which are capable of being used systematically, whether their nature is that of calculation or of experiment.

NEWBIGGING, T. Handbook for Gas Engineers and Managers. Eighth edition. 596 p. 8 vo. 1915. **$7.50**

Contents: Coal, Chief kinds of coal; Storage of coal, Analyses of coals and cannels; Spontaneous ignition of coal; Gases occluded in coal; Testing of coal for its producing qualities; Specific gravity of coal; Coal distillation; Gas production, Retort house; Retort stack, Retorts; Heating of retorts, Inclined retorts, Machine charging and drawing; Analysis of furnace gases; Retort bench mountings, Hydro carbon and other gases and vapors; Retort house tools and appliances; Condensation, Naphthalene, Condensers, Exhausters, Steam engines and boilers, Washers, Tower scrubbers, Washer scrubbers, Bye pass mains and valves, Tar and liquor wells and tanks, Purification; purifying house; Purifiers; Notes on lime; Lime burning; Station meters and other indicating and recording apparatus, Gas holder tanks, Gas holders, Governors, Main pipes; Main pipe joints, Wrought iron and steel main pipes; laying of main pipes, Explosions in main pipes; Testing of mains in the ground; Electrolysis of mains and service pipes, Discharge of gas through main pipes, Service pipes and fittings, Public lighting; Consumers' gas meters, Testing meters, Internal fittings, Coal gas testings; Appliances and methods; Tests for impurities, Illuminating power; Foreign and other (proposed) home standards of light; Jet photometers, Specific gravity of gas, Enrichment of coal gas; Public illuminations, Colored fires, Illumination devices, Use of gas for purposes other than lighting, Residual products, Coke and breeze; Coal tar, Ammoniacal liquor, Sulphur recovery, Cyanogen, Coal products, Elementary substances, Chemical and other memoranda; The gas industry; Cost of gas works; Bricks and brickwork, Mortar and concrete; Iron, steel, and other metals, Velocity and force of the wind; Specific gravity and weight of various substances, Office memoranda; Approximate multipliers, Tables of diameters, circumferences, areas of circles and slides of equal squares, Weights and measures; French weights and measures; Decimal system; Money tables

NEWELL, LYMAN C. Inorganic Chemistry. Revised edition. 595 p 12 mo. il 1916 **$2.00**

This revision and extension includes catalysis, osmotic pressure, hydrolysis, colloidal solutions, mass action, reversible reactions, displacement of equilibrium, solubility product, absorption, radioactivity, atomic weights, valence, and molecular weights

Many other topics have been improved and extended to conform to the advance of science, especially those dealing with the applications of chemistry to the arts and industries, as well as to life itself.

Nearly two hundred and fifty new problems and exercises have been inserted. Numerical data have been corrected and the tables have been revised

NEWTH, G. S. A Manual of Chemical Analysis: Qualitative and Quantitative. By G S Newth, F I C, Senior Demonstrator in Chemistry, Royal College of Science, London. Tenth impression. 488 p. 8 vo. 1918 **$3.00**

The qualitative section begins with the study of the reactions of the metals of the fifth group as the compounds of these metals are less complex

In the quantitative analysis, the author has confined himself to a comparatively small number of well tried typical methods and processes, preferring to describe and explain in tolerably full detail a few quantitative determinations in each of the various sections, such as shall furnish a thoroughly sound course of study, rather than attempt to cover—necessarily in more sketchy outlines a wider range of subjects

An important feature of the work is the prominence given to physico-chemical principles, such as the law of mass action, etc., upon which modern methods in analysis are based.

NICHOLSON, WILLIAM. Smoke Abatement. A manual for the use of manufacturers, inspectors, medical officers of health, engineers, and others. 256 p. 12 mo il 1905 **$2.00**

Contents: Introduction General legislation against the smoke nuisance Local legislation against the smoke nuisance Foreign laws in regard to smoke abatement Smoke abatement Smoke from boilers, furnaces, and kilns Private dwelling house smoke Chimneys and their construction Smoke preventers and fuel savers Waste gas from metallurgical furnaces. Summary and conclusions Index.

NIKAIDO, Y. Beet-Sugar Making and Its Chemical Control. Cloth. 366 p. 8 vo. il. 1909. **$3.50**

Contents: Definitions of chemical terms, Non metallic elements; Metallic elements; Organic chemistry, Cane-sugar, Polariscope and its accessories, Chemical apparatus and general methods for sugar analysis; Practical operation of beet sugar house; Special analysis. Appendix.

NISSENSON, H. The Arrangement of Electrolytic Laboratories, with special reference to the requirements of metallurgical practice by H. Nissenson, Director of the Central Laboratory of the Stolberg and Westphalia Company. Authorized translation by Joseph W. Richards, A. C., M. S, Ph D., Professor of Metallurgy, Lehigh University; Past President of the American Electrochemical Society. 81 p. 8 vo. il. 1905 **$1.50**

NORMANDY, FRANK. A Practical Manual on Sea Water Distillation. 244 p. 8 vo. il. 1910. **$2.50**

Contents: Distillation. Types of apparatus. Sea water. Steam fuels. The evaporator. The distilling condenser. Miscellaneous. Working of a distilling apparatus. Gas and oil stoves for evaporators. Multiple distillation.

NORRIS, JAMES F. Textbook of Inorganic Chemistry for Colleges. 677 p. 8 vo. il. 1921. **$3.50**

The more recent advances in chemistry in both its technical and theoretical aspects are thoroughly covered.

Contents: Introduction; Physical and chemical changes; Elements and compounds; Oxygen; Hydrogen; The atomic theory; Chemical equations; Chemical calculations; Measurement of gases; Water; Chlorine; Valence; Hydrochloric acid; Double decomposition; The energy factor in chemical change; Ozone and hydrogen peroxide; properties of gases; liquids and solids; Carbon and its oxides; Coal; Coke; Illuminating gas; Flames, Acids; Bases; Salts; Solutions; Chemical equilibrium; Sulfur and hydrogen sulfide; The oxides and acids of sulfur; Nitrogen and the atmosphere; Ammonia and its derivatives; Nitric acid and the oxides of nitrogen; The determination of atomic and molecular weights; The periodic law; The halogen family; Selenium and tellurium, Phosphorus, Arsenic, Antimony and Bismuth; Some important organic compounds; Silicon and boron; The acid-forming elements and the periodic classification; The physical properties of metals, Alloys; The chemical properties of metals, Metallurgy; Electrochemistry, The properties of oxides; Hydroxides and salts; Sodium, Potassium, Rubidium and Cesium, Calcium; Strontium; Barium and Radium; Beryllium; Magnesium; Zinc, Cadmium and Mercury; Aluminium; Tin and lead, Copper; Silver and gold; Iron; Cobalt and nickel, The platinum metals, Chromium, Molybdenum, Tungsten and uranium; Manganese, Radioactivity, The structure of atoms.

NORRIS, J. F. Experimental Organic Chemistry. By James F. Norris. 215 p 12 mo. il. 1915. **$1.50**

Chapter Headings: I Laboratory methods. II.—General processes; Hydrocarbons of the Methane series III —Unsaturated hydrocarbons. IV —Alcohols V —Acids. VI — Ethers, esters and anhydrides VII.— Aldehydes and ketones. VIII Amines and amides IX.— Cyanogen and related compounds X Halogen compounds XI. Compounds containing two unlike substituents. XII. Carbohydrates XIII — Compounds containing sulphur XIV Uric acid and related compounds. XV.— Aromatic hydrocarbons. XVI — Nitrocompounds and sulphonic acids XVII Halogen derivatives of aromatic hydrocarbons. XVIII.—Aromatic amines. XIX Diazo compounds. XX.—Aromatic alcohols, phenols, and ethers XXI — Aromatic acids. XXII Aromatic aldehydes, ketones, and quinones. XXIII —Aromatic compounds containing two or more unlike groups. XXIV.—Dyes and dyeing. XXV — Heterocylic compounds. XXVI Proteins. XXVII — The identification of organic compounds. Appendix.— Schiff's reagent.

NORRIS, J. F. Organic Chemistry. By James F. Norris, Ph.D., Professor of General Chemistry, Massachusetts Institute of Technology. 579 p. 12 mo. il. 1912. **$3.00**

Contents I.— Scope and methods of organic chemistry II.—hydrocarbons of the Methane series III Hydrocarbons of the Ethylene series. IV.— Hydrocarbons of the acetylene series. Diolefines. V Monatomic saturated alcohols VI — Unsaturated alcohols Polyatomic alcohols VII — Monobasic acids VIII Polybasic acids. IX — Ethers, anhydrides and esters. X Aldehydes and ketones. XI — Amines and amides XII — Cyanogen annd related compounds XIII. Halogen compounds XIV Compounds containing two unlike substituents XV — Carbohydrates XVI Compounds containing phosphorus, arsenic, sulphur, metals XVII — The identification of organic compounds and the determination of their structure. XVIII Uric acid and related compounds XIX — Cyclic hydrocarbons XX Determination of the structure of aromatic compounds, nitro compounds, and sulphonic acids XXI Halogen derivatives of aromatic hydrocarbons XXII — Aromatic amines and other reduction products of nitro compounds XXIII — Diazo compounds XXIV —Aromatic alcohols, phenols and ethers XXV Aromatic acids. XXVI — Aromatic aldehydes, ketones, and Quinones. XXVII — Aromatic compounds containing two or more unlike groups XXVIII — Dyes. XXIX. —Terpenes and camphors. XXX — Heterocylic compounds. XXXI.—Proteins.

NORTH, SYDNEY H. Oil Fuel: Its Supply, Composition and Application. Second edition, revised. 238 p. 12 mo. il. 1911. **$2.00**

Contents The sources of supply. The economic aspect of liquid fuel Chemical composition of fuel oils. Conditions of combustion in oil fuel furnaces Early methods and experiments Modern burners and methods Oil fuel for marine purposes Oil fuel for naval purposes Oil fuel on logomotives Oil fuels for road vehicles and motor launches Oil fuel for metallurgical and other purposes. Oil fuel for domestic purposes Appendices Index

NORTHRUP, EDWIN F. Laws of Physical Science and Epitome of the World's Heritage of the Fundamental of Its Knowledge and Wisdom. 210 p. Limp. 12 mo. 1917. **$2.25**

Contents: Mechanics; Hydrostatics; Hydrodynamics and capillarity, Sound, Heat and physical chemistry; Electrictiy and magnetism; Light, Bibliography and Index

NOWAK, CARL A. New Fields for Brewers and Others Active in the Fermentation and Allied Industries. 300 p. il. 8 mo. 1917. Bibliography pp 269-300 **$3.00**

Contents Introduction; Low alcohol beers; Non malt beverages and fruit juices; The yeast industry and its products; Vinegar; Malt flour, malt extract and diastatic preparations; Industry of breakfast foods; Chemical feeding stuffs; Dairy industry, Industrial alcohol; Mechanical appliances, Bibliography of related literature and patents; General index, including index to sources of supply and advertisers.

NOYES, W. A. Organic Chemistry for the Laboratory. Fourth edition, revised. 293 p 8 vo. il. 1920. **$3.50**

Contents: Analysis of compounds of carbons; General operations, Hydrocarbons; Alcohols and phenols, Ethers; Aldehydes, Ketones and their derivatives; Acids, Derivatives of acids; Hydroxy and ketonic acids; Carbohydrates; Halogen compounds; Nitro compounds; Amines; Diazo, Hydrazo, Nitroso and other nitrogen compounds; Sulfur compounds; Qualitative examination of carbon compounds

NYSTROM, P. H. Textiles; prepared in the extension division of the University of Wisconsin. 335 p. 12 mo. 1916. **$2.00**

OBERG, ERIK V., and JONES, F. D. Iron and Steel. A Treatise on the Smelting, Refining and Mechanical Processes of the Iron and Steel Industry. 328 p. 8 vo. 1918. **$2.50**

OBERG, ERIK V., and JONES, F. D. Machinery's Encyclopedia. 7 vols. 8 vo. 1917. **$36.00**

OLSEN, J. C. Textbook of Quantitative Chemical Analysis by Gravimetric, Electrolytic, Volumetric and Gasometric Methods. Fifth edition, revised and enlarged. 576 p. 8 vo. il. 1916. **$4.00**

Contents: The Balance; General operations; Determination of water. Determination of metals. As oxide; As Sulphate and sulphide; As Phosphate chromate and chloride. Determination of acids.

Halogens, sulphur and nitrogen; Carbonic, boric and phosphoric acids. Analysis of alloys. Alloys of silver, copper, lead, bismuth, cadmium and tin, Of alloys containing arsenic, antimony and tin, Of alloys containing iron, nickel and zinc Analysis of minerals. Minerals containing iron, aluminum and chromium; Sulphides containing manganese, nickel, cobalt and mercury, Carbonates containing calcium, barium, strontium and manganese, Silicates; Separation of sodium and potassium Electrolytic methods. The ionic theory, Apparatus and manipulation; Determination of metals Volumetric methods Calibration of apparatus, Acidimetry, Standard acids and alkalies, Titration of boric and carbonic acids. Oxidation and reduction methods. Potassium permanganate and dichromate solutions; Iodometric methods. Precipitation methods Determination of chlorides, cyanides and silver; Phosphoric acid Technical analysis. Iron, steel, coal; Water; Oils and fats, Gas; Stoichiometry.

OLSEN, J. C. (Editor). Van Nostrand's Chemical Annual. Edited by John C. Olsen. A handbook of useful data for analytical manufacturing and investigating chemists and chemical students. Fourth issue, enlarged 785 p. 12 mo. 1918. **$3.00**

Contents General (14 tables); Calculation of volumetric analyses (18 tables), Calculation of gas analyses (8 tables), Physical constants of chemical compounds (7 tables), Specific gravity tables (25 tables), Alcohol tables of the bureau of standards, Density, Volume and vapor pressure tables (57 tables); Equivalents of weights and measures (7 tables), Thermochemistry (27 tables); Stoichiometry; New books

OPPENHEIMER, CARL. Ferments and Their Actions. Translated from the German by C. Ainsworth Mitchell, B.A, F.I.C. 343 p. 12 mo. 1906. **$3.00**

Contents. General part. Introduction Definition of the conception of a ferment The chemical nature of ferments. The influence of external factors upon ferments. The mode of action of ferments. The physiological action of ferment. The secretion of ferments. The importance of ferments to the vital process. The hydrolytic ferments The proteolytic ferments Trypsin Bacteriolytic and hæmolytic ferments Proteolytic vegetable ferments Coagulating ferments. The saccharifying ferments. Animal diastases. Ferments of the polysaccharides, resembling diastes. Enzymes of the disaccharides. Ferments which decompose glucosides. Other hydrolytic ferments. The lactic acid fermentation. The oxidizing ferments. —Alcoholic fermentation. The biology of alcoholic fermentation The oxydases. Oxidizing fermentations. Systematic bibliography. Table of abbreviations. Indices.

OPPENHEIMER, CARL. Toxines and Antitoxines. Translated from the German by C. Ainsworth Mitchell, B.A., F.I.C. 274 p. 12 mo. 1906. **$3.00**

Contents: General part. Introduction Behaviour of toxines towards antitoxines. Endotoxines and bacterial proteins.

Special Part I.—The true toxines.—Diphtheria toxine Diphtheria antitoxine. Tetanus toxine. Botulism toxine—Pyocyaneus toxine —Toxine of symptomatic anthrax. Bacterial hæmolysines. II.—Endotoxines and other bacterial poisons. Cholera virus. Typhoid virus Typhoid virus—Vacillus coli communis—Dysentery—Plague toxine—Pneumotoxine—Gonotoxine Streptotoxine Poisons of the tubercle bacillus. Malleine Anthrax poison—Other bacterial poisons—Hog cholera—Malignant Oedema—Swine plague—Metschnikoff's vibrio—Dysentery toxine III—The vegetable toxines (phytotoxines).—Ricine Abrine—Crotine—Robine—Hay fever toxine. IV—The animal toxines (zootoxines)—Snake toxines Toad toxine—Salamander poison—Spider venom—Scorpion venom. Fish venoms. Toxine of fatigue.—Bibliography. Subject index.

OSMOND, FLORIS. The Microscopic Analysis of Metals. Edited by J. E. Stead, D. Met, F. R. S, F. I. C Revised and corrected by L. P. Sidney. Second edition, revised. 313 p. 8 vo. il. 1904. **$3.00**

Contents: Part I.—Metallography considered as a method of assay. Definition. Subdivisions of metallography. Anatomical metallography. Biological metallography Pathological metalography Part II.—The science of polishing Grinding Penetration Scratches. Finishing Scaling Part III—The micrographic analysis of carbon steels. Rough polishing Fine polishing Apparatus employed for photomicrography. Practical applications of metallography Primary constituents of carbon steels. Micrographic identification of constituents Detailed examination of selected steels. Segregation in steel and the phenomena of burning, overheating The macrostructure of steel Sulphur printing and heat tinting Conclusions Theoretical and practical Pure electro-deposited ferrite. The nomenclature of the microscopic substances and structures of steel and cast iron. Index. 195 photomicrographs, diagrams and figures in the text.

OSTWALD, W. A Handbook of Colloid-Chemistry. The recognition and theory of colloids and their general physico chemical properties. By Dr Wolfgang Ostwald, Privatdozent University of Leipzig. Translated from the third German edition by Dr. Martin H Fischer, Professor of Physiology, University of Cincinnati, with the assistance of Ralph F. Oesper, Ph D, Instructor in Chemistry, New York University and Louis Berman, M D, Staff Physician, Mount Sinai Hospital, New York Second edition. 284 p 8 vo. 1918. **$3.00**

OSTWALD, W. An Introduction to Theoretical and Applied Colloid Chemistry. 231 p. 8 vo il. 1917. **$2.50**

Contents: First Lecture—Fundamental properties of the colloid state Colloids as examples of dispersed systems Methods of preparing colloid solutions Second Lecture—Classification of the colloids The Physico-chemical properties of the colloids and their dependence upon the degree of dispersion Third Lecture The changes in state of colloids Fourth Lecture—Some scientific applications of colloid chemistry. Fifth Lecture—Some technical applications of colloid chemistry. Concluding remarks. Author index. Subject index

OWEN, F. A. Dyeing and Cleaning of Textile Fabrics. 253 p. 8 vo. 1909. **$2.50**

Contains a list of the various kinds of dyes, the art of fixing coloring matters, and miscellaneous recipes for dyeing cotton, wool, silk; the preparation of cleaning liquor; bleaching; the removing of spots and stains from garments; the washing of silk and cotton; the washing of flannel and other woolen articles; the cleaning of clothes, carpets, etc.; steam cleaning; dry cleaning.

PAGE, VICTOR W. The Modern Gasoline Automobile: Its Design, Construction, Operation. In the new and revised and enlarged 1918 edition all phases of automobile construction, operation and maintenance are described. Every part of all types of automobiles, from light cyclecars to heavy motor trucks and tractors, are described; not only the automobile, but every item of its equipment, accessories, tools needed, supplies and spare parts necessary for its upkeep, are fully discussed. 1032 p. 8 vo. il. 1918. **$4.00**

PAGE, V. W. Storage Batteries Simplified; operating principles, care and industrial applications, a complete, non-technical but authoritative treatise discussing the developments of the modern storage battery, outlining the basic operation of the leading types, also the methods of construction, charging, maintenance and repair. 280 p. 12 mo il. 1918. **$2.00**

A plainly written book understandable by the average reader.

PALMER, LEROY S. Carotinoids and Related Pigments: The Chromolipins. (American Chemical Society Monograph.) About 200 p. 8 vo. il. Ready about November 1, 1921.

Contents. Introductory. The Chromolipins of the Chloroplast. The Chromolipins of Roots and Tubers The Chromolipins of Fruits, Flowers, Seeds and Algae. The Chromolipins of Animal Tissues and Fluids The Chromolipins in Crustacea and other lowea animals. Chemical relation between plant and animal chromolipins. Biological relations of plant and animal chromolipins. Methods of isolation. Methods of identification. Quantitative estimation. Functions of Chromolipins in plants and animals.

PARK, JAMES, The Cyanide Process of Gold Extraction. Fifth edition, revised and enlarged. 347 p. 12 mo. il. 1913. **$3.50**

A textbook for the use of mining students, metallurgists, and cyanide operators.

Contents. The McArthur-Forrest process. Chemistry of the process. Laboratory experiments. Control, testing, and analysis of solutions. Analysis of cyanide solutions. The appliances and plant for cyanide extraction. The actual extraction by cyanide. The production and treatment of slimes. The cyanide treatment of concentrates. Leaching by agitation Zinc precipitation and treatment of gold slimes. The application of the process in different countries. The Siemens Halske process Other cyanide processes. Antidotes for cyanide poisoning. Index.

PARK, JAMES. A Textbook of Practical Assaying; for the use of mining schools, miners, and metallurgists. 242 p. 8 vo. il. 1915. **$3.00**

This is a study for use by the students in the classroom as well as by the miner and metallurgist in the field and laboratory. Prof. Park is an authority in this branch of analytical chemistry and he has the teacher's gift of presenting his knowledge in a most lucid fashion.

Contents. Introduction. Part I.—The assay of gold and silver ores; Gold and silver bullion; Platinum, silver and mercury; Lead ores, Tin, antimony and bismuth; Copper ores, slags and alloys; Iron; Manganese and ferro manganese ores; Zinc ores; Chromite nickel and cobalt, nickel, and cobalt ores. Part II—The estimation of chlorine, etc; of sulphur or sulphuric acid; Detection and estimation of arsenic; Estimation of phosporus and phosphoric acid; of potassium and the testing of gold ores by cyanide; Detection and estimation of barium, calcium, and strontium; Estimation of tungsten, titanium, thorium, and molybdenum; Analysis of limestone, dolomite, magnesite, and calcareous sandstones; Of Portland cement; Rock analysis for igneous and metamorphic rocks; The analysis of coals, Of a complex sulphide ore; Of soils, Of manures; Of oil shale for petroleum, Technical analysis of water; Estimation of alcohol and sugar; Analysis of milk; Principles of volumetric analysis; Determination of specific gravity; Computation of results Part III—Principles of qualitative analysis; Qualitative tests for acids; Index.

PARR, S. W., and HADLEY, H. F. Analysis of Coal with Benzol as a Solvent. 41 p. 8 vo. 1914. **$0.25**

Bulletin No 76 of the Engineering Experiment Station of the University of Illinois

PARR, S. W. Chemical Examination of Water, Fuel, Flue Gases and Lubricants. 130 p 8 vo. 1916. **$1.50**

PARR, S. W., and OLIN, H. L. Coking of Coal at Low Temperatures. 39 p. 8 vo 1915 **$0.25**

Bulletin 79 of the Engineering Experiment Station of the University of Illinois.

PARR, S. W. Effect of Storage on the Properties of Coal. 44 p. 8 vo. 1917. **$0.20**

Bulletin 97 of the Engineering Experiment Station of the University of Illinois.

PARR, S. W. Embrittling Action of Sodium Hydroxide on Soft Steel. 60 p. 8 vo. 1917. **$0.30**

Bulletin 94 of the Engineering Experiment Station of the University of Illinois.

PARR, S. W. Modification of Illinois Coal by Low Temperature Distillation. 48 p 8 vo. 1908 **$0.30**

Bulletin 24 of the Engineering Experiment Station of the University of Illinois.

PARR, S. W., and KRESSMAN. Spontaneous Combustion of Coal. 87 p. 8 vo. 1911. **$0.45**

Bulletin 46 of the Engineering Experiment Station of the University of Illinois.

PARR, S. W., and WHEELER, W. F. Unit Coal and the Composition of Coal Ash. 67 p. 8 vo. 1909. **$0.35**

Bulletin 37 of the Engineering Experiment Station of the University of Illinois.

PARR, S. W., and WHEELER, W. F. Weathering of Coal. 43 p. 8 vo. 1909. **$0.25**

Bulletin 38 of the Engineering Experiment Station of the University of Illinois.

PARRY, ERNEST J. Gums and Resins. (Pitman's Common Commodities and Industries.) 106 p. il. 12 mo. 1919. $1.00

CONTENTS: The true or proper resins; The gum resins, Balsams, Medicinal resins, etc.; The true gums.

PARRY, ERNEST J. Perfumery. (Pitman's Common Commodities and Industries.) 112 p. il. 12 mo. 1920. $1.00

CONTENTS: Introductory; Perfume materials in general; Plant perfume materials; Animal perfumes; Artificial perfumes.

PARRY, ERNEST J. The Chemistry of Essential Oils and Artificial Perfumes. In two volumes.

Vol. I. Monographs on Essential Oils. Fourth edition, revised and enlarged. 557 p. 8 vo. il. 1921. $9.00

CONTENTS: Jungermanniaceae; Coniferae, N. O. Gramineae; Palmae, N. O. Liliaceae; Amaryllidaceae, Irideae, Zingiberaceae; Piperaceae, Cannabinaceae; Jublandaceae; Myricaceae, Salicineae, Urticaceae, Chenopodiaceae; Lauraceae; Myristiceae, Monimiaceae, Euphorbiaceae, Santalaceae; Aristolochiaceae; Labiatate Verbanaceae, Convolvulaceae, Primulaceae; Rubiaceae; Oleaceae; Ericaceae, Valerianaceae, Compositae, Umbelliferae; Myrtaceaae, Roseaceae; Calcanthaceae, Rutaceae; Zgophyllaceae; Anacardiaceae; Burseraceae; Leguminosae; Geraniaceae, Tropaleolaceae; Meliaceae; Cruciferae, Magnoliaceae, Anonaceae, Pittosporeaceaoe; Hamamelidacee, Cistineae, Resedaceae; Turneraceae, Canellaceae; Dipterocarpaceae; Theaceae, Malvaceae; Ranunculaceae

Vol. II. Constituents of Essential Oils, Synthetic Perfumes and Isolated Aromatics, and the Analysis of Essential Oils. Third edition, revised and enlarged. 351 p. 8 vo. il. 1920. $7.00

CONTENTS: The Essential Oil in the Plant; The Constituents of Essential Oils and Synthetic Perfume Bodies, The Analysis of Essential Oils; Oil of Achillea Millefolium; Oil of Ammoniacum, etc.

PARRY, L. Systematic Treatment of Metalliferous Waste. 121 p. 8 vo. $2 50

CONTENTS: Sources of supply, Kind of waste, General chemical and metallurgical principles, Partial or semi refining, Smelting lead ashes and cleaning tin slags, Smelting tin ashes and solder ashes, Smelting antimonial material; Separation of copper from tin, lead and antimony; Copper work; Miscellaneous, Metal working and refining

PARRY, L. A. The Risks and Dangers of Various Occupations and Their Prevention. 200 p. 8 vo. 1900. $3.50

CONTENTS: Occupations accompanied by the generation and scattering of abnormal quantities of dust, Trades in which there is danger of metallic poisoning; Certain chemical trades; Some miscellaneous occupations; Trades in which various poisonous vapors are inhaled, general hygienic considerations.

PARTINGTON, J. R. The Alkali Industry. Cloth. 320 p. 8 vo. il. 1918. $3.00

CONTENTS: Introduction, The salt industry; Sulphuric acid; Natural soda and the Leblanc process, The ammonia soda process, Electrolytic processes; Chlorine and derived products, Nitric acid, Ammonia and ammonium salts, The oxidation of ammonia; Utilization and economy of sulphuric magnesium.

PARTINGTON, JAMES R. A Textbook of Thermodynamics (with special reference to chemistry). 550 p. 8 vo. 1914. $4.00

CONTENTS: Thermometry and calorimetry The first law of thermodynamics and some applications The second law of thermodynamics; Entropy. The thermodynamic functions and equilibrium fluids. Ideal and permanent gases. Changes of physical state Van der Waals' equation and the theory of continuity of states Thermochemistry. Gas mixtures. Elementary theory of dilute solutions General theory of mixtures and solutions Capillarity and absorption Electrochemistry. The theorem of Nernst Kinetic theories in thermodynamics

Expounds the principles of thermodynamics and illustrates their applicability to the various problems of physical chemistry Chemical problems receive the main consideration and other branches are either briefly treated or omitted

PARTRIDGE, C. S. Electrotyping. 213 p. 16 mo. il 1909 $2.00

PATTERSON, AUSTIN M. A French-English Dictionary for Chemists. 384 p 8 vo. 1921. $3.00

The war has greatly stimulated intercourse between French and English-speaking chemists, and there is more need than ever for this book, the only one covering its particular field. It follows the lines of the very successful German English work by the same author The entries, which number over thirty thousand, cover the entire chemical field and, in addition, include common general words and many troublesome idioms and verb forms.

PATTERSON, AUSTIN M. A German-English Dictionary for Chemists. 316 p. 12 mo. 1917. $2.50

"The need of a book of this kind has been keenly felt by all scientific men, whether well versed in the German language or otherwise Germany is headquarters for technical, scientific work, and German scientific publications contain a great amount of valuable matter, some of which is difficult to understand and which the average German English dictionary translates very inadequately. Dr. Patterson was formerly editor of *Chemical Abstracts*, as well as editor of chemical terms for Webster's New International Dictionary, and thus is peculiarly fitted for preparing a work of this kind While especial attention is given to this particular need, a fairly voluminous general vocabulary is also included, in which, however, occur many words having a technical as well as a popular meaning, and this meaning is given first, although in ordinary dictionaries it may be omitted or at least not given the prominence it deserves. The book is small enough to go in the pocket, is well bound in flexible covers, and cannot fail to be of everyday use to those who read the German scientific papers, and especially the chemical ones, to keep abreast of the times."—*India Rubber World*, May 1, 1917.

PATTERSON, D. Textile Color Mixing. A manual intended for the use of dyers, calico printers, and color chemists. Second edition, revised. 140 p. 8 vo. il. 1915. $3.50

PAUL, J. H. Boiler Chemistry and Feed Water Supplies. 242 p. 8 vo. 1919. $4.50

CONTENTS: Earth, air and water. Acids, bases and salts. Constituents of natural waters Scales and Deposits. Softening Soluble salts Iron. Carbonic acid. Concentration of waters containing carbonate of soda. Action of carbonic acid on iron. Corrosion Condensed waters. The superheater Priming External deposits. Failure of clean tubes. Water supplies Appendix; Carbonic acid in London waters

PEAKE, R. J. Cotton: From the Raw Material to the Finished Product. (Pitman's Common Commodities and Industries.) 134 p. il. 12 mo. 1919 $1.00

CONTENTS. Foundation of the English cotton trade; The raw material, The spinning mill Winding, warping and weaving, Bleaching, printing and dyeing; Market distribution of yarn and cloth, Trade unions, Masters' organizations

PEARSON, H. C. Crude Rubber and Compounding Ingredients. A textbook of rubber manufacture. Third edition. 422 p. 8 vo. il. 1918. $10.00

CONTENTS: Crude rubber, chemical and physical characteristics, sources of supply, Some little known rubbers and bastard or pseudo gums, Coagulation of rubber latex, Vulcanizing processes and ingredients Plantation Hevea and the optimum cure, Organic and inorganic accelerators, Fillers and ingredients used in rubber compounds, Substitutes for India rubber, natural and artificial, Substitutes for hard rubber and gutta percha, including cellulose products, Resins, balsams, gums, earth waxes, and gum like substances used in rubber compounding, Coloring matters, Acids, alkalies, and their derivatives used in rubber manufacture, Vegetable, mineral and animal oils used in rubber compounds and solutions; Solvents used in commercial and proofing cements, their origin, properties, and methods of use; Miscellaneous processes and compounds for the use in the rubber factory; Synthetic rubber, Vulcanization without sulphur; Reclaimed rubber and its uses; Physical tests and analysis of crude and vulcanized rubber; Primary processes, divisions in rubber manufacture, and typical compounds; Gutta percha Its sources, properties, manipulation, and uses.

PEARSON, H. C. Rubber Machinery. 419 p. 8 vo. il. 1915. $6.00

CONTENTS: The washing of crude rubber. Crude rubber drying. Dry sifting and batching of compound ingredients Mixing or compounding of rubber Preparing fabrics for calendering and spreading Calenders Clutches, drives and safety stops for mills and calenders Extraction of rubber and gutta percha from shrubs, vines, roots and leaves Extraction of resin from rubber and gutta percha Reclaiming Conveyors Temperature recording and controlling devices. Rubber laboratory equipment.

PEELE, ROBERT. Compressed Air Plant; the production, transmission and use of compressed air, with special reference to mine service. Fourth edition. 508 p. 8 vo. il. 1920. $4.50

CONTENTS: Part I—Production of Compressed Air. Introduction, Structure and operation of compressors, The compression of air; Wet compressors; Dry compressors; Compound or stage compressors; Air inlet valves, Discharge or delivery valves; Mechanically controlled air valves and valve motions; Performance of air compressors, Air receivers; Speed and pressure regulators for compressors; Air compression at altitudes above sea level; Explosions in compressors and receivers; Air compression by the direct action of falling water. Part II Transmission and Use of Compressed Air. Conveyance of compressed air in pipes; Compressed air engines; Freezing of moisture deposits from compressed air; Reheating compressed air; Compressed air rock drills; Hammer drills, Coal cutting machines; Channeling machines; Operation of mine pumps by compressed air; Pumping by the direct action of compressed air; Compressed air haulage for mines; Measurement of air consumption.

PEELE, R. Mining Engineers' Handbook. Compiled by a staff of specialists, Robert Peele, Professor of Mining Engineering, Columbia University, Editor-in-Chief. 2400 p. 16 mo. il. 1918. Flexible "Fabrikoid" binding $7.00
2-vol. edition, $8.00

A book prepared to meet the demands of engineers concerned with the installation of plant Covers mining and metallurgy, and the subjects allied thereto, and data on machinery, power plant, electric transmission, and structural design.

CONTENTS: Mineralogy Geology and mineral deposits Earth excavation. Rock excavation Explosives. Tunneling. Shaft-sinking Boring. Prospecting Underground transport Hoisting plant and ore bins. Drainage and ventilation. Compressed air plant. Electric power Surveying Maps and models. Mine organization and accounts. Costs Wages. Mine air, hygiene Explosives and accidents. Mining laws Mine examinations, valuations and reports Aerial tramways. Conveyers Ore dressing. Sampling and testing. Assaying Amalgamation and cyanidation Preparation and storage of coal Mathematics and mechanics Hydraulics. Thermodynamics. Steam engineering. Electrical engineering. Structural design. Tables.

PEIRCE, C. A., and CARVER, W. B. Handbook of Formulas and Tables for Engineers. Compiled by Clarence A. Peirce, Assistant Professor in Power Engineering in Sibley College, Cornell University, with Mathematical Sections by Walter B. Carver, Assistant Professor of Mathematics, Cornell University. Second edition. 188 p, pocket size, thin paper, illustrated, flexible binding. 1916. $2.00

A modern handbook for the engineer and student This new edition embodies a complete revision of the old material, with the addition of hydraulic formulas, tables of natural logarithms and hyperbolic functions, a paragraph on the laws of exponents, and additional steam tables and charts.

PELLEW, CHARLES E. Dyes and dyeing. 270 p. 8 vo. 1913. $2.00

CONTENTS: Introduction; Modern dyestuffs; Direct cotton or salt colors, Theory and practice; Sulphur colors; Indigo or vat colors; Basic colors; Feathers; Leather; Silk; Imitation silk; Tied and dyed work; Stencils; Batch or wax resist; Influence of war on the industry.

PERCIVAL, G. ARNCLIFF. The Electric Lamp Industry. (Pitman's Common Commodities and Industries.) 112 p. il. 12 mo. 1920. $1.00

CONTENTS: Historical; Glass manipulation; Equipment; Preparation of filament; The metal filament lamp; Gas filled lamps; Lamp machinery;

The arc lamp; Vapor lamps; Automobile lamps; Special types of lamps; Copping and testing.

PERKIN, A. G., and EVEREST, A. E. **The Natural Organic Coloring Matters.** 655 p. 8 vo. 1918. $10.00

CONTENTS: The anthraquinone group, The naphthaquinone group, The benzophenone group; The xanthone group; Flavone group; The chalkone and flavanone groups, Flavonol group; Pyran group; Dihydropyran group; Pyrone or coumarin group; Dicinnamoyl-methane group; Diphenyl dimethylolid group, Tannins; Coumarane group; Indole group; Lichens, lichen acids, and coloring matters derived therefrom; Isoquinoline group; Coloring matters of unknown constitution; Lakes from vegetable coloring matters, Appendices.

PERKIN, W. H., and KIPPING, F. STANLEY. **Inorganic Chemistry.** 2 vols. 734 p. 12 mo. il. 1911. Each $1.25
Set, $2.50

PERKIN, W. H., and KIPPING, F. STANLEY. **Organic Chemistry.** New and revised edition. 664 p. 12 mo. il. 1911. 2 vols. Each, $1.25
Set, $2.50

PERRIN, JEAN BAPTISTE. **Atoms.** Authorized translation by D. L. Hammick, 226 p. 8 vo. 1917. $2.50

PETERS, E. D. **Principles of Copper Smelting.** By Edward Dyer Peters. 612 p. 8 vo. 1907. $5.00

This work is devoted to the underlying principles of the subject, on which Dr Peters is the acknowledged authority

CONTENTS: Chapter I Methods and collectors II -First principles of Smelting III The principles of roasting. IV - The chemistry of smelting V The practice of roasting VI Blast furnace smelting VII Reverberatory smelting VIII Pyrite smelting IX. A practical study of slags X - Matte XI - The production of metallic copper from Matte. XII - The refining of copper XIII - The principles of furnace building XIV - Applications of thermochemistry. XV. Miscellaneous and commercial.

PETTIBONE, CHAUNCEY J. VALLETTE. **An Intermediate Textbook of Physiological Chemistry with Experiments.** 328 p. 8 vo. 1917. $2.50

PFANHAUSER, W. **Production of Metallic Objects Electrolytically.** 162 p. 8 vo. il. 1906 $1.50

CONTENTS: Historical review; Baths for copper, Galvanoplasty; Physical properties of the copper deposit, Behavior of copper anodes, Constants of the bath and calculation of the amount of deposit; Industrial plants, Particular devices for special purposes, Production of uniform deposits, Manufacture of metallic powders and the like; Manufacture of metallic foil; Production of wire, etc ; Manufacture of bodies of large size; Manufacture of parabolic mirrors, Manufacture of tubes; Electrolytic etching; Electrolytic engraving; Appendix.

PHILLIPS, F. C. (Editor). **Methods for the Analysis of Ores, Pig Iron and Steel.** 170 p. 8 vo. il. 1901. $1.50

CONTENTS. Methods used at the laboratory of the Carnegie Steel Company; Edgar Thompson Steel Works and Furnaces, Braddock, Pa, by C. H Murray; Methods used at the Laboratory of the Ohio Steel Company, Youngstown, Ohio, by J C Barrett, Methods used at the laboratory of the Carnegie Steel Company, Lucy Furnace, Pittsburgh, Pa, by Robert Miller; Methods used at the laboratory of the Monongahela Furnace, McKeesport, Pa, by Frederick Crabtree, Methods used at the laboratory of the Pittsburgh Malleable Iron Company, McKees Rocks, Pa, by H. E. Diller; Methods used at the laboratory of the Carbon Steel Company, Pittsburgh, Pa, by G O. Loeffler, Methods used at the laboratory of the Carnegie Steel Company, Duquesne, Pa, by J M. Camp; Methods used at the laboratory of the Shenango Valley Steel Company, New Castle, Pa, by A L. Cromlish; Methods used at the laboratory of the Clinton Iron and Steel Company, Pittsburgh, Pa, by A B Harrison; Methods used at the laboratory of the W Dewees Wood Company, McKeesport, Pa, by R B Carnahan, Methods used at the laboratory of the Republic Iron and Steel Company, Youngstown, Pa, by H. L. Brinker; Methods used at the laboratory of the Isabella Furnace Company, Etna, Pa, by F G Brinker, Method used at the laboratory of the Cambria Steel Company, Johnstown, Pa, by F S. Hyde; Methods used at the laboratory of the Firth Sterling Steel Company, Demmler, Pa, by A G. McKenna; Methods used at the laboratory of the LaBelle Steel Works, Allegheny, Pa, by Geo G Class and C E. Manby; Methods used at the laboratory of the Park Steel Company, Pittsburgh, Pa, by C. M. Johnson, Methods used at the laboratory of the American Sheet Steel Company, Vandergrift, Pa, by W. H. Ginder; Methods used at the general laboratory of the American Steel Hoop Company, Pittsburgh, Pa, by Henry S Marsh; Methods used at the laboratory of the American Steel and Wire Company., Shoenberger Steel Works, Pittsburgh, Pa, by C D Chamberlain; Methods used at the laboratory of the Pittsburgh Steel Foundry Company, Glassport, Pa, by George F. Hodge Appendix The determination of phosphorus in coke and coal, by James M Camp; The determination of phosphorus in ores, pig iron and steel containing arsenic, by James M. Camp; The determination of alumina as phosphate, by James M Camp; Blast furnace cinders and their analysis, by James M. Camp; The analysis of chrome and tungsten steels, by A. G. McKenna; A quick method for the determination of carbon in ferrochrome, by A. G. McKenna; The analysis of slags, by A. B. Harrison, The analysis of mill cinder, by A. B. Harrison, A rapid method for phosphorus determination in iron and steel, by James O. Handy; The complete analysis of chrome ore, by A. G. McKenna.

PHILLIPS, J. **The Handling of Dangerous Goods.** A handbook for the use of government and railway officials, carriers, shipowners, insurance companies, manufacturers and users of such goods, and others. Comprising notes on the properties of inflammatory, explosive, and other dangerous compounds, and the modes of storage and transport thereof, with official classifications, parliamentary enactments, particulars of recorded accidents, etc. 374 p. 12 mo. il. $4.50

CONTENTS. Acids. Alkalies, Salts; Gases, *Inflammable liquids*, Coal tar and its products; Crude petroleum and its products; Fixed oils and fats; Essential or volatile oils; Various highly inflammable liquids, Inflammable solids; Miscellaneous substances; Common substances liable to "spontaneous" combustion; Explosives; Notes of instructive accidents with various materials, illustrating their nature; Special railway classification, mode of packing, and general regulations for the conveyance of explosives and other dangerous goods, by merchandise trains; Appendix.

PICARD, H. K. **Copper, From the Ore to the Metal.** (Pitman's Common Commodities and Industries.) 130 p. il. 1920. 12 mo. $1.00

CONTENTS: Its properties and sources of supply; The concentration of copper ores; Roasting, The blast furnace; Pyritic smelting; Blast furnace products, The treatment of matte, Smelting in reverberatory furnaces, The Welsh process smelting for "black copper"; Electrolytic refining; Treatment of copper ores by wet processes; Costs and marketing.

PICKARD, J. A. **Modern Steel Analysis; a selection of practical methods for the chemical analysis of steel.** 128 p. 12 mo. 1914. $1.25

PICKERING, GEORGE FENWICK. **Aids in the Commercial Analysis of Oils, Fats, and Their Commercial Products.** A laboratory handbook. 133 p. 8 vo. 1917 $3.00

This concise work, by a former research chemist to the late Dr. Lewkowitsch, treats of the technique of sampling, and the examination of physical and chemical properties There are special chapters on fatty oils, miscible castor oils, boiled oils, blown oils, etc , sulphonated oils, neutral fats, foots, etc.; fat splitting and distillation products, glycerine, resins, recovered products and their distillation products; and oils, fats and waxes of the British pharmacopœia.

PICKWORTH, C. N. **Logarithms for Beginners.** Third edition. 58 p. 12 mo. 1913. $1.00

PICKWORTH, C. N. **The Slide Rule.** A practical manual. Twelfth edition. 118 p. 12 mo. 1916. $1.50

Describes the principle on which the slide rule operates, with detailed instructions for making the various kinds of calculations possible on it.

PILCHER, RICHARD B. **The Profession of Chemistry.** 213 p. 12 mo. 1920. $2.00

CONTENTS Preface, Synopsis of training and possible careers for a chemist, Preliminary education, Pharmacists and chemists, Professional training, Prospects and conditions of practice, Professional organization, Public analysts and official agricultural analysts, Professional procedure, Industrial chemistry; Chemistry and the state, Teaching, Women in professional chemistry, Chemists in war Index.

PILCHER, RICHARD B. **What Industry Owes to Chemical Science.** With an introduction by Sir George Beilby. 159 p. 12 mo. 1918. $1.50

CONTENTS. Minerals and metals; Heavy chemicals and alkali; Coal and coal gas, Dyes, explosives and cellulose, Oils, fats and waxes, Leather, Rubber, Mortar and cement, Refractory materials, Glass and enamels, Pottery and porcelain; Chemical products, Photography, Agriculture and food, Brewing; Alcohol, wines and spirits; Tobacco, inks, pencils, etc , Gases, Government chemistry

PLIMMER, R. H. A. **Chemical Constitution of the Proteins.** 174 p. 8 vo. 1918. $2.25

CONTENTS: Hydrolysis; The isolation and estimation of the units, Tyrosine; Cystine, Tryptophane; The other monoamino acids, The isolation of the diamino acids, Protamines, Histones, Albumins and globulins, The vegetable proteins; Phosphoproteins, The scleroproteins, Various proteins, Derivatives of proteins, Analysis of proteins by the distribution of the various kinds of nitrogen; Bibliography

PLIMMER, R. H. A. **Practical Organic and Bio-Chemistry.** 648 p. 8 vo. il. 1915. $7.00

CONTENTS: Recognition of an organic compound, Isolation and preparation of pure organic compounds, Criteria of their purity, Composition of organic compounds, Identification of an organic compound, Hydrocarbons, Halogen derivatives of the hydrocarbons, Alcohols, Esters, Ethers, Mercaptans and sulphides, Aldehydes, Ketones; The fatty acids, Halogen substitution derivatives of the fatty acids, Acid or acyl chlorides, Acid anhydrides, Unsaturated alcohols, aldehydes and fatty acids, Hydroxy-, keto and dybasic acids, Amines, Amides; The amino acids; Betaines, Cyanogen compounds, Guanadine and its derivatives, Di-, tri-, and polyhydric alcohols, Fats and oils; Waxes; Lecithins, The carbohydrates, Aromatic compounds, Tannins, Heterocyclic compounds, Ureides, Pyrimidines; Glyoxaline or iminazole derivatives; Purines, Nucleic acids, Furfurane, or furane, and its derivatives; Thiophene and its derivatives, Pyrrole and its derivatives, Pyridine and its derivatives, Hydroaromatic compounds, Complex aromatic compounds, The anthoxanthins, The anthocyans, Indole and its derivatives, Quinoline and isoquinoline, The alkaloids, The proteins, Enzymes; Individual groups of proteins, The chemical constitution of hæmin and hæmatoporphyrin, The pigments of leaves, Metabolism; Composition of the commoner tissues used as food-stuffs for animals; Analysis of normal urine, Analysis of tissues; Tables; List of reagents.

POESCHL, VICTOR. **An Introduction to the Chemistry of Colloids; a compendium of colloidal chemistry for students, teachers, and works managers.** Translated by Herbert H. Hodgson, M. A. 114 p. 12 mo. 1910. $1.75

CONTENTS General characteristics. Nomenclature. Properties of colloidal solutions. The relation of colloidal solutions to solutions proper and to suspensions. The disperoids and their classification. Preparation of colloidal solutions. Research methods. Ultramicroscopy. Recent views on the nature of the colloid state. The importance of colloidal chemistry in chemical industry and technology. Literature of the subject. Index

POLLEYN, F. **Dressings and Finishings for Textile Fabrics and Their Application.** Translated from the third German edition by Charles Salter. 279 p. 8 vo. il. 1911. $3.50

CONTENTS: The dressing process and materials for same; stiffenings and glazes; Adhesive dressings; Materials for soft dressings; Dressings for filling and loading; Antiseptic dressing ingredients; Dyeing and blueing agents; Various dressings; The preparation of dressing; Recipes for dressings; Dressings for linens; Yarn dressings; Laundry glazes; Yarn sizing; Finishing woolen goods; Finishing silk fabrics; Waterproof dressings; Fireproof dressings; Special Finishing process; The application of dressing preparations; Testing dressings.

A description of all materials used in dressing textiles; their special properties; the preparation of the dressings and their employment in finishing linen, cotton, woolen and silk fabrics; fireproof and waterproof dressings from the chemico-physical point of view and also describing the principal machinery employed.

POOLE, HERMAN. The Calorific Power of Fuels; with a collection of auxiliary tables showing the heat of combustion of fuels, solid, liquid and gaseous. Third edition, rewritten by Robert Thurston Kent, M.E. 267 p. 8 vo. il. 1918. $3.00

Since the publication of the 2nd edition (1900) advances in this subject and in the use of new fuels (fuel oils, gasoline, denatured alcohol, and blast furnace, natural, producer, and coke-oven gases) and in methods of investigation, have been of such great importance as to warrant a thorough rewriting. New material is based largely upon studies made by the United States Geological Survey and the Bureau of Mines. Chapter 11 describes the analysis and measurement of the products of combustion. Appendix contains the boiler test code of the American Society of Mechanical Engineers.

PORRITT, B. D. The Chemistry of Rubber. 104 p. 12 mo 1914. $1.00

CONTENTS: The Properties of Crude Rubber; Constitution and Derivatives, Methods of Vulcanization, Theories of Vulcanization, Waste Rubber and Its Utilization; Synthetic Caoutchouc, Bibliography.

PORTER, HORACE C. Coal Carbonization. (American Chemical Society Monograph.) About 475 p. 8 vo. il. Ready about November, 1921.

CONTENTS (Tentative) Fuel and industry, relation to progress and civilization. Economics of fuel utilization. Central stations for the generation and distribution of power and heat. Gas and coke industries. Nature of coal and coal carbonization. Industrial coal carbonization. Coke ovens of the non-recovery type. By-product recovery coke ovens. Coal gas retorts of the horizontal and inclined type. Coal gas retorts of the vertical type. Miscellaneous carbonizing processes. Low temperature carbonization. By-product recovery systems. Coke. Special cokes. Tar and oils. Ammonia and cyanides. Coal gas. Sulphur in carbonization. Appendix.

POTTS, HAROLD E. Chemistry of the Rubber Industry. 163 p. 8 vo. 1912. $2.50

(Author is a member of the International Rubber Testing Committee.)

CONTENTS: The colloidal state. Suspensoid colloids. Emulsoid colloids. Raw rubber. Gutta-percha and balata. Mixing. Control. Compounding ingredients. Vulcanization. Vulcanized rubber.

Aims at bridging the gap between pure chemistry and manufacturing processes. It is intended to explain to the chemist the chief properties of the material with which he has to deal and the chief lines in which his work may run. It is also intended to explain to the rubber technologist the nature of the problems with which the rubber chemist is concerned and to make clear not only the difficulties, but also the possibilities of chemical routine and research. The production and manufacture of rubber are considered, not for the sake of their own technique, but for their bearing on chemical work. The analytical processes of most importance are critically described and explained.

POYNTING, J. H., and THOMPSON, J. J. A Textbook of Physics; Electricity and Magnetism. Parts I and II. Static electricity and magnetism. 345 p. 8 vo. il. 1914. $4.00

The present volume contains an account of the chief phenomena of electric and magnetic systems when they are respectively charged and magnetized. The effects of changes in the systems are only considered statistically, after the changes are effected, and the systems have become steady again. The phenomena accompanying the progress of change belong to electric current or electro-magnetism and will be treated in another volume.

POYNTING, J. H., and THOMPSON, J. J. A Textbook of Physics; Heat. Fourth edition. 354 p. 8 vo. il. 1911. $5.00

CONTENTS: Temperature. Expansion of solids with rise of temperature. Expansion of liquids. Expansion of gases. Circulation and convection in liquids and gases. Quantity of heat. Specific heat. Conductivity. The forms of energy. Conservation of energy. Mechanical equivalent of heat. First law of thermodynamics. The Kinetic theory of matter. Change of state—liquid—vapour. Change of state—solid—liquid. Water in the atmosphere. General account of radiation. Theory of exchanges. Radiation and temperature. Thermodynamics. Thermodynamics of isothermal and adiabatic changes. Thermodynamics of radiation. Index.

POYNTING, J. H., and THOMPSON, J. J. A Textbook of Physics; Sound. Fifth edition, revised. 164 p. 8 vo. il. 1914. $3.50

CONTENTS: The nature of sound and its chief characteristics. The velocity of sound in air and other media. Reflection and refraction of sound. Frequency and pitch of notes. Resonance and forced oscillations. Analysis of vibrations. The transverse vibrations of stretched strings or wires. Pipes and other air cavities. Rods. Plates. Membranes. Vibrations maintained by heat. Sensitive flames and jets. Musical sand. The superposition of waves. Index.

POYNTING, J. H., and THOMPSON, J. J. A Textbook of Physics; Properties of Matter. Fifth edition. 223 p. 8 vo. il. 1900. $4.00

This book is intended chiefly for the use of students who lay most stress on the study of the experimental part of physics, and who have not yet reached the stage at which the reading of advanced treatises on special subjects is desired. The mathematical methods adopted are very elementary. A number of alterations have been made in this new edition.

CONTENTS: Weight and mass. The acceleration of gravity. Its variation and the figure of the earth. Gravitation. Elasticity. Strain. Stresses. Relation between stresses and strains. Torsion. Bending of rods. Spiral springs. Impact. Compressibility of liquids. The relation between the pressure and volume of a gas. Reversible thermal effects accompanying alterations in strains. Capillarity. Laplace's theory of capillarity. Diffusion of liquids. Diffusion of gases. Viscosity of liquids. Index.

PRANKE, E. J. Cyanamide; manufacture, chemistry and uses. 112 p. 8 vo. 1913. $1.50

CONTENTS: Discovery and manufacture of cyanamide; Preparation and properties of cyanamide; Analytical methods; Storage of cyanamide; Decomposition of cyanamide in the soil; Retention of cyanamide nitrogen in soil; Nitrification of cyanamide; Nitrogen; Toxicity of fertilizers; Agricultural use of cyanamide; Making fertilizer mixtures with cyanamide; Permanganate availability of cyanamide; Fire and water hazard of cyanamide.

PRESCOTT, A. B., and JOHNSON, O. C. Qualitative Chemical Analysis; a guide in qualitative work, with data for analytical operations, and laboratory methods in inorganic chemistry. Seventh edition. Thoroughly revised by John C. Olsen, A.M., Ph.D. 440 p. 8 vo. 1916. $4.00

This new edition retains all of the excellent features which have given this book such extended use in the past, both as a class room and as a reference text, while adding the results of recent progress in the science. All data and tables have been brought up to date.

CONTENTS: PRINCIPLES OF ANALYTICAL CHEMISTRY.—The chemical elements and their atomic weights. Periodic system. Classification of the metals as bases. Commonly occurring acids. Operations of analysis. Solution and ionization. Order of laboratory study. THE METALS.—The silver, tin, copper, iron, zinc, calcium and alkali groups. THE NON METALS. Systematic examination.

PRICE, G. M. Modern Factory; safety, sanitation and welfare. 574 p. 8 vo. 1914. $5.00

CONTENTS: The factory. Factory fires and their prevention. Factory accidents and safety. Lighting and illumination. Sanitation. Employers' welfare work. Air and ventilation in factories. Industrial dusts and dusty trades. Industrial poisons. Factory legislation. Factory inspection.

PRICE, T. S. Per-Acids and Their Salts. 123 p. 8 vo. 1912. $1.60

CONTENTS: Introduction, Persulphates and perselenates; Perborates, Percarbonates, Pernitric acid and perphosphoric acid, Pertitanates; Perzirconates and pertannates, Pervanadates, percolumbates and pertantalates, Perchromates, Permolybdates, Pertungstates and Peruranates, Literature references, Index.

PRICE, W. B., and MEADE, R. K. Technical Analysis of Brass and the Non-Ferrous Alloys. 376 p. 12 mo. 1911. $3.00

CONTENTS: PART I. Introduction. Engineering Alloys. Apparatus for electrochemical analysis. PART II. DETERMINATION OF THE METALS. Aluminum. Antimony. Arsenic. Bismuth. Cadmium. Copper. Iron. Lead. Magnesium. Manganese. Nickel and cobalt. Phosphorus. Silica. Sulphur. Tin. Zinc. PART III. ANALYSIS OF ALLOYS. Aluminum alloys. Antimony alloy. Babbitt and fusible metals. Brass. Bronze. Copper alloys. Electrolytic assay. PART IV.—CONTROL AND ANALYSIS OF PLATING SOLUTIONS. Brass, copper, zinc, and silver cyanide solutions. Nickel and gold solutions. Electrolytic determinations. Control of solutions. International atomic weights. Table of factors for use in alloy analysis.

PRIDEAUX, E. B. R. The Theory and Use of Indicators. An account of the chemical equilibria of acids, alkalies and indicators in aqueous solution, with applications. Diagrams. 382 p. 8 vo. 1917. $5.00

CONTENTS: Equilibria of acids, bases and salts, and the physical methods of determining acidity and alkalinity; Light absorption in the visible spectrum and colorimetry; Theories of color in their relation to the ionic theory, chemical constitution and the formation of salts; Color of indicators as a function of hydrion concentration; Determination and use of indicator constants, Preparation and use of solutions of standard hydrion concentration, Applications, Course of neutralization and the theory of titration, Solution equilibrium and titration of some acids; List of principal indicators, with absorption spectra.

PROCTER, H. R. Leather Industries Laboratory Book of Analytical and Experimental Methods. 460 p. 8 vo. il. 1919. $10.00

RACE, JOSEPH. Chlorination of Water. 158 p. 12 mo. il. 1918. $1.50

CONTENTS: Historical, Modus operandi; Dosage; Bacteria surviving chlorination; Complaints, Bleach treatment; Liquid chlorine; Electrolytic chlorine and hypochlorites; Chloramine; Results obtained; Appendix.

RACE, JOSEPH. Examination of Milk for Public Health Purposes. 224 p. 12 mo. il. 1918. $1.75

This book is primarily intended as a practical handbook for those engaged in the chemical and bacteriological examination of milk for public health purposes, and is also intended to be of material assistance to students and others who have previously assimilated the fundamentals of bacteriological technique. Chemical methods and data have been included which will enable the examiner to interpret the results obtained.

CONTENTS: Constituents of milk. Normal composition of milk. Chemical examination. Bacteria in milk. Enumeration of bacteria in milk. Excremental organisms. Pathogenic organisms. Cells, dirt and debris. Miscellaneous. Appendix. Name index. Subject index.

RALSTON, OLIVER C. Electrolytic Deposition and Hydrometallurgy of Zinc. Author is metallurgist, Hooker Electrochemical Co., Niagara Falls, N. Y. 201 p. 8 vo. 46 il. 1921. $3.00

A thorough and authoritative presentation of present practice, and of the underlying theory of leaching, purification and electrolysis. Special emphasis is placed in this book on methods of purification of the solutions before electrolysis.

CONTENTS: Introduction, History of zinc hydrometallurgy; Roasting zinc ores, Sulphate solutions; Leaching and purifying; Electrolysis of zinc sulphate solutions, Chlorinating zinc ores and purifying solutions; Electrolysis of zinc chloride; Electrolytic zinc refining, Melting electrolytic zinc, Examples of practice; Zinc chemicals; Economics in zinc hydrometallurgy.

RAMBOUSEK, JOSEF. Industrial Poisoning from Fumes, Gases and Poisons of Manufacturing Processes. Translated by T. M. Legge. 360 p. 8 vo. 1913. $5.00

RAMSAY, A. R. J., and WESTON, H. C. Artificial Dyestuffs; their nature, manufacture, and uses. 212 p. 8 vo. 1918. $1.60

RAMSAY, A. R. J., and WESTON, H. C. Manual of Explosives. 127 p. 12 mo. 1916. $1.00

RAMSAY, W. The Gases of the Atmosphere; the history of their discovery. 314 p. 12 mo. 1916. $3.00

RAND Metallurgical Practice, Text-book of. Designed as a "Working Tool" and practical guide for metallurgists upon the Witwatersrand and other similar fields. In two volumes, each complete in itself and sold separately.

This work has been written by a body of technical men actively engaged in current metallurgical practice upon the Witwatersrand. Each has based his treatment, of the special branch of the subject with which he has dealt, upon the experience gained and the investigations made during the course of his daily duties. Every effort has been made to describe in full detail such working points as are likely to prove of practical service to mill and cyanide men and to mechanical engineers; designing or maintaining the plant employed, the fundamental principles on which present practice has been based and from which further improvements may be anticipated, have been given due consideration.

Volume I Contents: Introduction. The Witwatersrand and its mines. Sorting and breaking. Stamp milling. Tube milling Treatment of sand Slime. Precipitation Clean up and smelting Assaying On testing. Section 1.—Testing cyanide solutions Section 2.—Testing of supplies. Section 3 - Testing of gold ore. Section 4.—Testing a plant in operation Chemistry of banket ore treatment. Tables.
468 p. 8 vo. il. 1912. $7.50

Volume II Contents: Section 1—The design and construction of reduction plants General consideration. Sorting and breaking plant. Crushing plant. Amalgamating plant The mill clean-up plant. The cyanide plant. The power supply. Estimating. The cost of reduction plants. Section 2.—The transport of materials Bibliography and references. Index.
438 p. 8 vo. il. 1912. $7.50

RANDAU, P. Enamels and Enamelling. An introduction to the preparation and application of all kinds of enamels for technical and artistic purposes. Translated by Charles Salter. 196 p. 8 vo. il. 1901. $5.00

Contents: Composition and properties of glass; Raw materials used in enamel manufacture; Substances for producing opacity; Fluxes, Pigments; Decolorizing agents, Testing the raw materials and enamel mass; Subsidiary materials; Preparing materials for enamel making; Mixing the materials; The preparation of various technical enamels.

RAWSON, CHRISTOPHER; GARDNER, WALTER M., and LAYCOCK, W. F. A Dictionary of Dyes, Mordants, and Other Compounds Used in Dyeing and Calico Printing. 372 p. 8 vo. 1901. $7.50

A practical work for use in the laboratories of color chemists, dyers, and manufacturers. It comprises a general description of dyes, mordants, and other substances employed in dyeing and calico printing, with their properties and uses; and wherever possible the methods of examining and assaying these various bodies.

READ, T. T. (Editor). Recent Copper Smelting. 459 p. 8 vo. 1914. $2.50

REDGRAVE, GILBERT R., and SPACKMAN, CHARLES. Calcareous Cements. Second edition, revised. 310 p. 8 vo. il. 1905. $4.50

Their nature, manufacture, and uses, with some observations upon cement testing.

Contents: Introduction. The burning of lime. Retrospective and historical review of the cement industry. The early days of Portland cement. The composition of Portland cement. The chemical analysis of cement raw materials, Portland cement, and lime Analyses of raw materials and Portland cements, calculations of proportions, rapid methods of making determinations, and specific gravity. Preparation of the mixture of raw materials by the wet method. The dry-process: Treatment of the raw materials by dry methods. The dry process: Crushing, grinding, and auxiliary machinery. The calcination of the cement mixture. Revolving or rotary kilns. Grinding, storing, and packing the cement—Dust collecting contrivances. The composition of mortar and concrete. Cement testing. Accelerated tests for constancy of volume. The employment of slags for cement making. Scott's cement, scientific cement, cements produced from sewage sludge and the refuse from alkali works, and Sidero cement. The plaster cements Specifications for Portland cement Appendix. A.—Kirklady's tests of mortar and Selenitic cement. B—The effects of sea water on cement C.—German standard tests. D—Report of a committee of the American Society for testing materials on a standard specification for cement. E.—The cost of cement manufacture. F.—Dorking stone lime. Index.

REDWOOD, BOVERTON. Petroleum. A Treatise on the Geographical Distribution and Geological Occurrence of Petroleum and Natural Gas; the physical and chemical properties, production and refining of petroleum and ozokerite; the characters and uses, testing, transport, and storage of petroleum products, and the legislative enactments relating thereto; together with a description of the shale oil and allied industries, and a full bibliography. Third edition, revised. In three volumes. 8 vo. Cloth. 1913. $18.00

Vol. I. 400 p.

Contents: Historical account of the petroleum industry: Geological and geographical distribution of petroleum and natural gas; Physical and chemical properties of petroleum and natural gas; Origin of petroleum and natural gas; Production of petroleum, natural gas, and ozokerite.

Vol. II. 425 p.

Contents: Refining of petroleum; Shale oil and allied industries; Transport, storage, and distribution of petroleum; Testing of crude petroleum, petroleum, and shale products, ozokerite and asphalt; Uses of petroleum and its products.

Vol. III. 389 p.

Contents: Statutory, municipal, and other regulations relating to the testing, storage, transport, and use of petroleum and its products; Statistics; Marine transport of petroleum; Import duties levied on United States petroleum; Thames conservancy.

REDWOOD, BOVERTON, and EASTLAKE, ARTHUR W. Petroleum Technologists' Pocket-book. 454 p. 16 mo. il. 1915. $3.75

A pocket-book of ready reference for the office, the factory, or in the field As in hardly any other profession the oil man needs continually to refer to important data. It is in compact form with a complete index, which makes it possible to find the desired information without loss of time.

Contents: General arrangement. General information about petroleum. Geological, physical and chemical. Production. Refining, transport, storage, and testing. Used. Weights and measures. Miscellaneous. Statistics.

REDWOOD, I. I. Theoretical and Practical Ammonia Refrigeration; a work of reference for engineers and others employed in the management of ice and refrigeration machinery, by Iltyd I. Redwood, Assoc. Mem. Amer. Soc. M. E., Mem. Soc. Chemical Industry. Seventh edition. 145 p. 25 pages of tables, 12 mo. 1914. $1.00

Contents: Introductory remarks. British thermal unit. Mechanical equivalent of a unit of heat. Specific heat. Latent heat. Absolute pressure. Absolute temperature. Theory of refrigeration. Freezing by compressed air and by ammonia. Characteristics of ammonia. Anhydrous ammonia. Description of plant. Construction details. Lubrication Valves The separator The condenser. The receiver. Brine tank. Working details. Method of charging with ammonia. Jacket water. Condensing water Loss due to heating ammonia. Excess condensing pressure and its variation. Cooling directly by ammonia. Brine Freezing point of brine Methods of making. Regulation of brine temperature Determination of refrigeration efficiency, equivalent of a ton of ice Loss in compressors. Distribution of mercury wells. Examination of working parts. Indicator diagrams. Calculation of the maximum capacity of a machine. Preparation of anhydrous ammonia. Condenser worm Best test for ammonia. Tables. Index.

REMINGTON, JOSEPH P. The Practice of Pharmacy. New eighth edition. Based on the Ninth Decennial Revision of the United States Pharmacopæia. 1987 p. 8 vo. 1917. $8.00

A treatise on the modes of making and dispensing official, unofficial, and extemporaneous preparations, with descriptions of their properties, uses, and doses Professor Remington, by virtue of his labours on the new Pharmacopæia as Chairman of the Committee of Revision, is equipped to make this the latest edition of his masterpiece, the most complete compendium of pharmaceutical practice in the world.

RICHARDS, C. B. Entropy-Temperature and Transmission Diagrams for Air. 20 p. 8 vo. 1913. $0.25

Bulletin 63 of the Engineering Experiment Station of the University of Illinois

RICHARDS, J. W. Metallurgical Calculations. By Prof. Joseph W. Richards, head of the Department of Metallurgy, Lehigh University. 3 vols. 8 vo. 1918.

These three volumes cover the basic principles of chemical calculations, and their application to metallurgical problems. These are explained in a manner as simple as possible. Lists of chemical and physical constants used in ordinary metallurgical practice are given.

Part I. Introduction. Chemical and Thermal Principles. Problems in Combustion Fourth edition. 238 p. 8 vo. $2.50

Contents: Introduction. The chemical equation. Fourth application of thermochemistry. The use of the thermochemical data. Thermochemistry of high temperatures Thermophysics of chemical compounds, artificial furnace gas, chimney-draft and forced draft. Conduction and radiation of heat.

Part II. Iron and Steel. Second edition. 236 p. 8 vo. $2.50

Contents: Calculation of the charge of the blast furnace. Utilization of fuel in the blast furnace. The heat balance sheet of the blast furnace. The rationale of the hot-blast and dry-blast. Production, heating and drying on air blast. The Bessemer process. Thermochemistry of the Bessemer process. The temperature increase in the Bessemer converter. The open hearth furnace. Thermal efficiency of open hearth furnaces. The electrometallurgy of iron and steel.

Part III. The Metals Other than Iron. (Non-ferrous Metals.) Second edition. 197 p. 8 vo. $2.50

Contents: Roasting and smelting copper ores. Electrometallurgy of copper. The volatility of lead. Roasting lead ores. Reduction of roasted ore. Electrometallurgy of lead. Electrolytic refining of silver bullion. Volatilization of silver and gold. Roasting of sphalerite. Reduction of zinc oxide Electrolytic furnace. Reduction of alumina.

Parts I, II and III, bound in one volume, 676 p., 8 vo. $6.00

RICHARDS, R. H. Textbook of Ore Dressing. By Robert H. Richards, S.B., LL.D., Professor of Mining Engineering and Metallurgy, Emeritus, Massachusetts Institute of Technology, and author of "Ore Dressing." Assisted by Earl S. Bardwell and Edwin G. Goodwin. 702 p. 8 vo. il. 1909. $5.50

Contents: General principles. Preliminary breaking. Rolls. Steam stamps. Gravity stamps and amalgamation. Grinders other than gravity stamps. Laws of crushing. Preliminary washing and hand sorting. Preparation of the crushed ore for concentration. Principles of screen sizing and classifying. Coarse-sand concentrating. Fine-sand concentrating. Slime concentrating. Miscellaneous processes of separation. Accessory apparatus. Mill principles and processes. General consideration. Coal dressing.

RICHARDS, W. A., and NORTH, H. B. A Manual of Cement Testing. For the use of engineers and chemists in colleges and in the field. 147 p. 12 mo. il. 1912. $1.50

Contents: Classification, composition, manufacture. Sampling. Fineness specific gravity. Normal consistency. Constancy of volume. Tensile strength, compressive strength and transverse tests. Sand and stone. Laboratory equipment. Part played by chemical analysis. Preparation of sample for analysis. Analysis of cement, limestone, marl, slag and clay. Standard specifications for Portland cement.

This laboratory manual is intended to assist in bringing about uniformity in the testing of cement. The authors have endeavored to present, in a somewhat condensed form, such directions as will en-a student in the laboratory or an operator in the field office to interpret correctly the Standard Methods of Testing and Specifications for Cement, as published by a committee of the American Society of Civil Engineers, American Society for Testing Materials, Association of American Portland Cement Manufacturers and the American Railway Engineers and Maintenance of Way Association. Sufficient detail is given to enable all students to learn the same manipulations and thus be able to perform each test in a certain well-defined and similar manner. Mr. Richards is a practical engineer and has been engaged in practical engineering work and teaching of engineering subjects for a number of years, and Dr North has made a special study of cement and for two years was a student of Prof. Henri Le Chatelier, the great French authority on cement.

RICHARDSON, CHARLES H. Building Stones and Clays. A handbook for architects and engineers. 437 p. 8 vo. il. 1917. $5.50

A profusely illustrated textbook by the Professor of Mineralogy in Syracuse University Has a chapter on artificial stone.

"The object has been to furnish an elementary knowledge of the essential minerals in building stones and the objectionable minerals they sometimes contain; to show the chief characteristics of the more important building stones; to give their geographical distribution and range in compressive strength; to impart some information as to the physical and chemical properties of clays and the products that may be manufactured from them."—*Preface*.

RICHARDSON, O. W. Electron Theory of Matter. 614 p. 8 vo. 1914. $4.50

RICHMOND, HENRY DROOP. Dairy Chemistry. Third edition, revised. A practical handbook for dairy chemists and others having control of dairies. 502 p. 8 vo. il 1920 $8.00

CONTENTS: Introductory. The constituents of milk. The analysis of milk. Normal milk: Its adulteration and alterations and their detection. The chemical control of the dairy. Biological and sanitary matters. Butter. Other milk products. The milk of mammals other than the cow. Standardization and calibration of apparatus. Appendix. Useful tables. Index.

RICHMOND, HENRY DROOP. The Laboratory Book of Dairy Analysis. Second edition, revised. 106 p. 8 vo. il. 1914. $1.25

CONTENTS: Introduction. The analysis of milk. The analysis of liquid milk products. The application of analysis to the solution of problems. The analysis of butter. The analysis of cheese. Tables of calculation Appendix. Index

RICHTER, VICTOR v. Organic Chemistry, or Chemistry of the Carbon Compounds. Vol. I, Chemistry of the Aliphatic Series. Newly translated and revised from the German edition by Percy E. Spielmann. Second edition, revised. Cloth. 735 p. 8 vo. 1919. $7.00

CONTENTS: Introduction; Fatty compounds; Allphatic substances or methane derivatives; Chain or acyclic carbon derivatives; Hydrocarbons; Halogen derivatives of the hydrocarbons, Oxygen derivatives of the methane hydrocarbons; The monohydric alcohols and their oxidation products; Dihydric alcohols or glycols, and their oxidation products; Carbonic acid and its derivatives; Trihydric alcohols; Glycerols and their oxidation products; Tetrahydric alcohols and their oxidation products; The pentahydric alcohols or pentitols and their oxidation products; Hexa- and polyhydric alcohols and their oxidation products; Animal substances of unknown constitution.

RICKARD, T. A., compiler and editor. The Flotation Process. Compiled and edited by T. A. Rickard. 364 p. 8 vo. il. 1916. $2.00

Fifty thousand tons of ore are being treated daily in the United States by the frothing, or bubble, levitation method In this volume Mr. Rickard, the well-known authority, has brought together and carefully edited nearly forty articles written by experts for the *Mining and Scientific Press* during the past year. There are also many references to the history of the art, including descriptions of significant patents.

RICKARD, T. A., and RALSTON, O. C. Flotation. 416 p. 8 vo. il. 1917. $3.00

"This is a report on recent progress in the application of flotation to metallurgical practice. It does not pretend to be a last word. No final treatise can be written on an art that is growing as flotation has grown during the last two or three years. We have tried to give the worker the latest obtainable information on the technology of the subject."—*Preface*.

RICKARD, T. A. Concentration by Flotation. By T. A. Rickard, Mining Engineer and Editor, The Mining and Scientific Press, and others. 1921. $7.00

A compilation of articles appearing in the Mining and Scientific Press, during the years of 1905 to 1920 Five of the articles were reprinted in a book entitled, "The Flotation Process," by T A. Rickard, published in 1916, and seventeen of them appeared in "Flotation," by T. A. Rickard and O. C Ralston, published in 1917. This new volume besides the twenty-two articles already mentioned, contains eighteen later articles on the subject, and serves as a convenient compendium of the principal literature on the technology of the process.

CONTENTS: A glossary of flotation, The history of flotation (T A Rickard); Principles of flotation (T. A Rickard); The flotation of gold and silver minerals (T. A. Rickard), Flotation litigation I. (T. A. Rickard); Flotation litigation. II (T. A. Rickard); Testing ores for the flotation process (O. C. Ralston and Glenn L Allen), Testing ores for flotation (James M. Hyde); Flotation in a Mexican mill (R. T. Mishler); Flotation at the Central Mine, Broken Hill (James Hebbard); Cyanide treatment of flotation concentrate (Charles Butters and J E Clennell); Disposal of flotation residue (W. Shellshear); Flotation principles (C. Terry Durell); The theory of flotation (H Hardy Smith), The flotation of minerals (Robert J. Anderson); Principles underlying flotation (Joel H. Hildebrand); Molecular forces and flotation (Will H Coghill); The armor in flotation (Will H Coghill); Theory of ore flotation (H. P. Corliss and C. L. Perkins); Colloids (E. E. Free); Differential flotation (O. C. Ralston); Flotation at the Calaveras Copper (Hallet R. Robbins); The disposal of flotation products (Robert S. Lewis); Mechanical development in flotation (O. C. Ralston); The flotation of oxidized ores (Glenn L. Allen and Oliver C. Ralston); Flotation at Cobalt, Ontario (W. E. Simpson); Cascade method of froth-flotation (H. Hardy Smith); Flotation of semi-oxidized silver ore (E. J. Atckison); The development of flotation at the Broken Hill Proprietary Mine, Australia (Edwin T. Henderson); The Bradford process at Broken Hill (Edwin T. Henderson); The flotation of galena at the Central Mine, Broken Hill (R J. Harvey); Recovery of copper from flotation by leaching (Percy R. Middleton); The Horwood process as applied to the copper-zinc ore of the Afterthought Mine (A. H. Heller), A modification of Horwood's process for the treatment of copper-zinc ores (H. L. Hazen); The smelting of flotation concentrate at Garfield (T. A Rickard), Flotation practice of the Utah Copper Company (T. A. Rickard); Froth flotation at Broken Hill (C. C. Freeman); A résumé of literature on the theory of flotation, with critical notes (H. R. Adam).

RICKARD, T. A. Technical Writing. 178 p. 12 mo, 1920. $1.50

CONTENTS: General principles. Naturalness. Clearness. Precision. Superlatives and other diluents It, one, with, while. The relative pronouns. Prepositions and preposition verbs Hyphens and compound words Slovenliness Jargon. Construction of sentences. Composition. Style. Index.

Based on lectures at the University of California.

RIDEAL, ERIC K., and TAYLOR, H. S. Catalysis in Theory and Practice. 496 p. 8 vo. 1919. $6.00

RIDEAL, SAMUEL, Glue and Glue Testing. 196 p. 8 vo. 1914. $5.00

CONTENTS: Constitution and properties, Raw materials and manufacture; Uses of glue; Gelatine; Glue testing; Commercial aspects.

RIDEAL, SAMUEL. The Carbohydrates and Alcohol. 234 p. il. 8 vo. 1920. $4.00

CONTENTS: Introduction; Starch and its products; Starch; Dextrin; Glucose; Maltose, Sugar, Cane sugar; Beet Sugar; Sugar refining; Minor sources of sugar; Caramel, Alcoholic fermentation; Beer; Malting; Mashing, boiling and hopping; Fermentation; Wine; Grapes and the vine; Fermentation; Tartar, Distillation; Grain spirit; Potable spirit, Industrial alcohol; Synthetic alcohol, Vinegar; Preparation of the wort; Acetification; Acetic acid, Acetone and glycerine.

RIES, H. Clays: Their Occurrence, Properties, and Uses. With especial reference to those of the United States. By Professor Heinrich Ries, Ph.D. Second edition, revised. 554 p. 8 vo. il. 1914. $5.00

Describes the occurrence, properties, methods of mining and manufacturing, and uses of a vast variety of clays.

CONTENTS: Origin of clay. Chemical properties of clay. Physical properties of clay. Kinds of clays. Methods of mining and manufacture. Distribution of clay in the United States. Alabama. Louisiana. Maine. North Carolina. North Dakota to Wyoming. Fullers' Earth.

RIES, H. Technology of the Clay Industry. (U. S. Geological Survey.) 1895. $1.50

Contains a compilation of analyses of clays in the United States.

RIES, H. Economic Geology of the United States. 856 p. 8 vo. il. 1916. $5.00

CONTENTS: Coal. Petroleum. Natural gas and other hydrocarbons Building stones and clays. Cements. Salines and associated substances. Gypsum. Fertilizers. Abrasives. Minor minerals. Underground waters Ore deposits. Iron. Copper. Lead. Zink. Silver. Gold. Minor metals.

RIES, H., and WATSON, T. L. Engineering Geology. 722 p. 8 vo. il. 1915. $5.00

CONTENTS: The rock forming minerals. Character, mode of occurrence, and origin of rocks. Weathering and soils. Surface waters. Underground waters. Landslides. Wave action and shore currents. Lakes: Their origin and relation to engineering work. Glacial deposits. Building stone. Limes, cement and plaster Clay and clay products Coal series. Petroleum, natural gas and hydrocarbons. Road foundations and road materials. Ore deposits. Historical geology.

ROBERTS-AUSTEN, W. C. An Introduction to the Study of Metallurgy. Revised and enlarged by F. W. Harbord, A R.S.M. Sixth edition, revised. 478 p. 8 vo. il. 1910. $6.50

In most English works on Metallurgy, the most important metals are dealt with separately and in detail. In this volume the subject is treated as a whole, choosing typical appliances and indicating their use in connection with groups of metals.

In this new revised edition of Sir William Roberts-Austen's work, Professor Harbord has endeavored to preserve the general scheme of the work and to make as few alterations as possible, but the results of recent research and general metallurgical progress have made certain revisions and additions inevitable.

Among the most important changes are the revisions of the chapter on physical constants, which has been revised in accordance with the latest available data; the chapter on Pyrometry has been practically rewritten on account of the rapid progress which has been made in pyrometric work; a new chapter on Metallography has been prepared to replace Chapter XI on Microstructure in the last edition, the subject of fuel has been given a chapter to itself instead of being discussed in connection with thermal measurement, and this chapter is illustrated by types of modern cooking ovens and gas producers. In the chapters on furnaces, sketches of typical furnaces used in modern metallurgical practice have been introduced as illustrations to replace those of furnaces which are no longer in general use, and sketches of some of the principal types of electric furnaces have also been added.

CONTENTS: The relation of metallurgy to chemistry Physical properties of metals. Alloys The thermal treatment of metals. Pyrometry. Metallography. Fuel Materials and products of metallurgical processes Furnaces The supply of air to furnaces. Thermochemistry. Typical metallurgical processes Economic considerations.

ROBERTSON, JOHN BRAITHWAITE. The Chemistry of Coal. 96 p. 12 mo. 1919. $1.25

CONTENTS: Classification and occurrence of coal; The origin of coal; The action of solvents on coal; The oxidation of coal; The destructive distillation of coal; The analysis of coal—Sampling; The analysis of coal—Proximate analysis; The analysis of coal—Ultimate analysis; The analysis of coal—Calorific value; The properties of coal on combustion; Bibliography; Index.

ROBERTSON, T. B. Physical Chemistry of the Proteins. By T. Brailsford Robertson, Ph.D., D.Sc., Professor of Bio-

chemistry in the University of Toronto. With very complete lists of Literature cited and Indexes. 498 p. 8 vo. 1918. $5.00

Our exact knowledge of the physical chemistry of the proteins is of recent date, but a great variety of facts are scattered widely in medical, biological and chemical literature which have hitherto never been adequately correlated In this book, while emphasis is laid primarily upon general principles, the endeavor has also been made to provide for those interested in this subject a reference book in which the widely scattered literature is collected and systemized and rendered more generally accessible to students and specialists.

ROBINSON, CLARK S. Solvent Recovery. To be published by The Chemical Catalog Co., Inc. Ready about September 15, 1922.

RODENHAUSER, W., and Others. Electric Furnaces in the Iron and Steel Industry. Third Edition 460 p. 8 vo il 1920 $4.50

Contents Part I.—Electric Furnaces; Their Theory, Construction and Operation. Fundamental laws and principles. Effects of the electric current Power factor and alternating current theory General conditions for the operation of electric furnaces The arc furnaces in general Types of arc furnaces The induction furnace in general. Types of induction furnaces. Part II. A. Materials for furnace construction and the costs of operation B The electro metallurgy of iron and steel Electric smelting of iron ores. Use of the electric furnace for smelting and refining

ROGERS, ALLEN (Editor). Industrial Chemistry. A manual for the student and manufacturer. Written by a staff of forty two eminent specialists. Third edition, thoroughly revised and enlarged. 1255 p. 8 vo il. 1920. $7.50

Contents: General Processes by Allen Rogers, Water for Industrial Purposes by H Stabler and A A Chambers, Fuels by J C. W. Frazer, Sulphuric Acid by W M Grosvenor, Nitric Acid by W. M. Grosvenor, Salt and Hydrochloric Acid by O I. Shinn, Elements and Compounds by Allen Rogers, Chlorine and Allied Products by W. F. Doerflinger, Electrochemical Industries by W. L. Landis, Lime, Cement and Plaster by Richard K Meade, Clay, Bricks and Pottery by Allen Rogers, Glass by James Gillinder, White Lead by G W Thompson, Zinc Oxide by George B Heckel, Pigments and Paint Oils by Maximilian Toch; Mixed Paints by Henry A Gardner, The Metallurgy of Iron and Steel by Bradley Stoughton, Fertilizers by A G Stillwell, Commercial Organic Chemicals by Allen Rogers, Illuminating Gas by W. H Fulweiler, Coal Tar and its Distillation Products by F E. Dodge; The Petroleum Industry by Thomas T Gray, The Destructive Distillation of Wood by W B Harper, Oils, Fats and Waxes by Carleton Ellis; Linseed Oil by G W Thompson, Hydrogenation of Oils by Carleton Ellis; Lubricating Oils by Augustus H Gill, Soaps and Soap Powder by Lincoln Burrows, Glycerine by A. C Langmuir; Laundering by W F Faragher; Essential Oils, Synthetic Perfumes and Flavoring Materials by Alois von Isakovics; Turpentine and Rosin by Charles H. Herty, Resins, Oleo Resins, Gum Resins and Gums by Allen Rogers, Shellac by A. C. Langmuir, Rubber and Allied Gums by Frederic Dannerth, Varnish by A H Sabin, Sugar by Guilford L Spencer; Starch, Glucose, Dextrin and Gluten by G W Rolfe, Brewing and Malting by Robert Wahl, Wine Making by L W Haas, Distilled Liquors by Gustave L Goob, Textiles by J Merritt Matthews; Dyestuffs and their Application by L A Olney, The Art of Paper Making, by G. F Lull, Cellulose Industries by Jasper E Crane, Explosives by O W Willcox; Leather by Allen Rogers, Glue and Gelatine by Jerome Alexander; Casein by E L Tague; Practical Applications of Colloid Chemical Principles by Jerome Alexander; Dehydrated, Dried and Evaporated Foods, Condensed Foods by Clarence V Ekroth; Baking by Arnold Wahl

Aims to furnish a complete text on industrial chemistry that shall be recognized as a standard of modern methods and processes The subject matter is essentially descriptive without omitting the necessary theoretical considerations, and each chapter follows as far as possible this general plan The raw material, the treatment of raw material preparatory to manufacture and manufacturing processes, its chemical theory and reactions involved The illustrations are numerous and wherever possible references are cited

ROGERS, ALLEN. Laboratory Guide of Industrial Chemistry. Second edition, entirely rewritten and enlarged. 219 p. 8 vo. il. 1917. $2.00

Contents: General Process; Inorganic Preparations; Organic Preparations, Dyeing of Textile Fibers, Pigments and Lakes; Driers, Varnishes, Paints and Stains, Soap and Allied Products, Leather Manufacture, Wood Fiber, Pulp and Paper; Useful Data

The object of this elementary laboratory guide is to acquaint students of chemistry with actual commercial problems by bringing to their experience practical methods of handling materials on a large scale; the care and use of machinery; the cost of raw materials; transportation, wage system, handling of men and shop discipline The processes described for application on a small scale are adaptable to the larger commercial bases, and in many instances the methods are those commonly used at present, and actual factory practice is carried out

ROHLAND, P. Colloidal and Crystalloidal State of Matter. 54 p. 12 mo. 1912. $1.25

ROLFE, G. W. The Polariscope in the Chemical Laboratory. An introduction to Polarimetry and Related Methods. By George William Rolfe, A. M, Instructor in Sugar Analysis in the Massachusetts Institute of Technology. 320 p. 12 mo. 1905. $2.25

In this book the entire matter of sugar analysis is taken up; also the various processes of sugar manufacture and sugar refining It explains in an elementary way the fundamental principles and their application in general laboratory practice.

ROLPH, GEORGE N. Something About Sugar; its history, growth, manufacture and distribution. 341 p. 8 vo. il. 1917. $4.00

It gives a history of the commodity and its production in different parts of the world, and seeks to show the various steps by which sugar from cane or beets is prepared for the consumer.

ROSCOE, H. E., and SCHORLEMMER, C. A Treatise on Chemistry. In two volumes. 8 vo.

Vol. I. The Non-Metallic Elements. Fifth edition, completely revised with the assistance of Dr. J. C. Cain. 967 p. 1920. $9.00

Contents: Historical introduction; General principles of the sciences; Physical determination of the atomic weight of monatomic gases; Chemical nomenclature; The non-metallic elements; Comparison of metrical with English measures.

Vol. II. The Metals. Fifth edition, completely revised. 1483 p. 1913. $12.00

Contents: The metals; Determination of atomic weights of metals, valency of the elements, Crystalline form and colloidal solutions of metals, Alloys and amalgams, Constitution of salts, acids and bases; Solubility, fusibility and volatility of salts; Generic properties of salts, Chemical change and the law of mass action; Spectrum analysis; Crystallography; Systematic description of the metals and their derivatives by groups, The radioactive elements.

ROSE, T. KIRKE, D.Sc. The Metallurgy of Gold. Sixth edition. 601 p. 8 vo. il. 1915. $7.50

The author gives in condensed form such information concerning the new methods and machinery used in the treatment of gold ores which could be gleaned out of the large stock of literature and experience of recent years. Mr. Rose has had considerable practical experience in extracting gold and silver in the Western States of America.

Contents The physical and chemical properties of gold. Alloys of gold Chemistry of the compounds of gold. Mode of occurrence and distribution of gold. Treatment of shallow placer deposits Deep placer deposits. Ore crushing in the stamp battery Amalgamation in the stamp battery Other forms of crushing and amalgamating machinery Fine grinding Concentration in gold mills. Dry crushing Roasting Chlorination The cyanide process—chemical reactions The cyanide process general methods The cyanide process—special methods and examples of practice The refining and parting of the gold bullion The assay of gold ores. The assay of gold bullion Statistics of gold production and consumption. Bibliography. Index.

ROSENHAIN, WALTER. An Introduction to the Study of Physical Metallurgy. 375 p. 8 vo. il 1915. $4.00

Contents: Introductory *Structure and constitution of metals and alloys* Microscopic examination of metals, The metallurgical microscope, The microstructure of pure metals and of alloys, Thermal study of alloys; The Constitutional diagram and the physical properties of alloys; Typical alloy systems, The iron-carbon system. *The properties of metals as related to their structure and constitution* Mechanical testing of metals, Effect of strain on the structure of metals; Thermal treatment of metals; Mechanical treatment of metals, including casting, Defects and failures in metals and alloys.

ROSENHAIN, WALTER. Glass Manufacture. 264 p. 8 vo. Second edition, largely rewritten. 1919 $4.00

Contents: Physical and Chemical Properties; The Raw Materials of Glass Manufacture, Crucibles; Furnaces for the Fusion of Glass; Process of Fusion, Processes Used in the Working of Glass, Bottle Glass; Blown and Pressed, Rolled or Plate; Sheet and Crown; Colored; Optical, Miscellaneous Products, Appendix

ROTHERY, G. C., and EDMONDS, H. O. The Modern Laundry; including dry cleaning and dyeing. 2 vols. 348, 314 p. 8 vo. 1911. $15.00

ROTHWELL, C. F. SEYMOUR, The Printing of Textile Fabrics. 312 p. 8 vo. il. 1897. $6.00

Contents Introduction Part I—The machinery used in textile printing. Part II—Thickeners and mordants. Part III—The printing of cotton goods The bleaching of cotton piece goods for printing The steam style Colors produced directly on the fibre. Dyed styles. Padding style Resist and discharge styles The printing of compound colorings, etc. Part IV—The printing of woolen goods. Part V- The printing of silk goods. Part VI—Practical recipes for printing Appendix Useful tables. Index. Patterns.

ROWLAND, ARTHUR J. Applied Electricity for Practical Men. 375 p. 8 vo. il. 1916. $2.50

This work, aiming to avoid more than the simplest mathematics and all unnecessary theory, as well as problems of apparatus design, is written from the standpoint of the man "who puts up and operates electric circuits and apparatus" Clearly illustrated and has helpful problems and questions at the chapter endings.

ROYLE, H. M. Chemistry of Gas Manufacture. 316 p. 8 vo. il. 1914. $4.50

This book covers questions and points likely to arise in the ordinary course of the duties of the engineer or manager of a gas works not large enough to necessitate the employment of a separate chemical staff It treats of the testing of the raw materials employed in the manufacture of illuminating coal gas, and of the gas produced. The preparation of standard solutions is given, as well as the chemical and physical examination of gas coal.

RUSHMORE, D. B., and LOF, ERIC A. Hydro-electric Power Stations. 822 p. 8 vo. il. 1917. $6.00

Three quarters of this work of over 800 pages is devoted to the problems of electrical and hydraulic engineering; the rest, to the economical aspects, covering the compilation of reports; load factor, water, storage, auxiliary stations, investigation of an enterprise, and cost of plants; as well as a chapter on organization and operation. In the appendices are references to periodical articles describing the principal American plants: principal data on transmission systems operating at 40,000 volts or over; and a standard testing code for hydraulic turbines.

RUSSELL, W. M. Operation of Gasworks. 209 p. 8 vo. il. 1917. $2.50

An effort to present in a concise and practical manner information on gas works management and operation according to American practice in small or medium-sized gas works. Does not profess to cover the whole field. Addressed to the foreman, superintendent, engineer, and cadet.

Contains chapters or organization and management, chemical control, coal gas, water gas, general plant operation, calorimetry and photometry

Author is manager, Emporia Gas Company.

SABIN, ALVAH HORTON. Red Lead, and How to Use it in Paint. Third edition, rewritten and enlarged. 139 p. 8 vo. il. 1920. $2.00

The essential facts about red-lead paint are presented in a clear and easily readable manner, backed up by the author's thirty years' experience and study of paints of all kinds. Compared with the second edition, which was issued early in 1919, this new printing has been rewritten and amplified to an extent so considerable as to make it almost a new book

CONTENTS: How litharge is made; How red lead is made, Orange mineral; Objections to red-lead; What high grade red lead is, Relation of lead pigments to oil; Difficulty in removing oil from lead pastes, Fineness is a merit, Litharge in red lead; How to use litharge, Lampblack in red lead; Some things are not known, Turpentine, What are natural paint requirements? Elastic undercoat cracks, How much pigment is needed; How many coats? The finishing coat, Mixed pigments, Good + worse is not better, Volume proportions, Simplicity and complexity, Theory of inhibition, The Havre de Grace bridge, High grade red-lead has long been known; Heavy paint, Water tanks and pipes, Boiled oil, Elevated water tanks, Ship painting, Railway cars and other vehicles, How to test a red lead paint, Advantages of paste red lead, Sanitation, Need of cleaning; Sand blast, Pickling, Scraping and wire-brushing, Mill scale; Rust is persistent and obstinate, Brushes, Paint calculations, Volume proportion; A sample problem, Thoroughness; Specifications, Striping coat, Quality of materials, Drier and turpentine, Notes on the foregoing specifications Guaranty, oil, area covered, spreading capacity, as a paint for wood Appendix I Analytical methods, Determination of Pb_3O_4 (National Lead Company Laboratory). Appendix II: Specifications for painting bridges, Three coats on new bridges, Two coats on new bridges; Repainting bridges, Exterior ship painting; Interior ship painting; Specification for painting water tanks; Painting gas-holders; Architects' painting specifications for all iron, steel and other metal work Notes.

SABIN, ALVAH H. The Industrial and Artistic Technology of Paint and Varnish. Second edition, revised. 473 p. 8 vo. il. 1917. **$4.00**

CONTENTS: Early history; Varnish, Origin of the name; Linseed oil; Linoleum, Manufacture of varnish, Tung oil, Japans and driers; Rosin; Spirit varnishes; Pyroxylin varnishes, Oil paints and paints in Japan; Varnish or enamel paints; Chinese and Japanese lacquers, Protection of metals against corrosion; Water pipe coating; Ship's-bottom paints; Ship and boat painting; Carriage painting, House painting; Furniture varnishing.

SABIN, ALVAH H. White Lead: Its Use in Paint. 133 p. 12 mo. 1920. **$1.25**

SADTLER, SAMUEL SCHMUCKER. Chemistry of Familiar Things. Second edition, revised. 320 p. 8 vo. il. 1916. **$2.50**

A layman's chemistry but yet of great value to the instructor who carries a short course in the high school The author clearly presents information concerning the outstanding materials of daily life in such a way that the novice is stimulated to a further study of the science. No child's book by any means, but a thoroughly interesting treatment of the intelligent adult

CONTENTS. Introduction. Brief chemical outline. Historical development of chemistry. The periodic system of elements The chemistry and production of light, heat, combustion, and insulation Air, oxidation, and ventilation. Water Alkalies and salts Metals Gold and silver. Chemistry of the earth's evolution Soil and its conservation Food elements and food classes. Individual foods. Animal feeding. Fermentation Chemistry of the body Soaps, solvents, and paints. Paper and textiles. Leather and rubber. Silicious substances and glass. A few important definitions. Index.

SADTLER, SAMUEL P. Industrial Organic Chemistry. Fourth edition. Adapted for the use of manufacturers, chemists, and all interested in the utilization of organic materials in the industrial arts. 601 p. 8 vo. il. 1912. **$6.00**

CONTENTS: Petroleum and mineral oil industry Industry of the fats and fatty oils. Industry of the essential oils and resins The cane-sugar industry The industries of starch and its alteration products. Fermentation industries—Malt liquors, wine, ardent spirits, bread, vinegar. Milk industries Vegetable textile fibres—Papermaking, gun-cotton, etc. Textile fibres of animal origin Wool, silk, artificial silk. Animal tissues and their products—Leather, glue, etc Industries based upon destructive distillation—Wood and coal The artificial coloring matters. Natural dye colors Bleaching, dyeing and textile printing. Appendix—The metric system Tables for determination of temperatures Specific gravity tables Alcohol tables. Physical and chemical constants of fixed oils and fats.

SADTLER, SAMUEL P., and COBLENTZ, VIRGIL. Pharmaceutical and Medical Chemistry. Fourth edition revised. Intended for the use of Pharmaceutical and medical students. Being the fourth edition of Sadtler and Coblentz's Chemistry, revised and rewritten. Based on the Eighth Decennial Revision of the United States Pharmacopœia. 749 p. 8 vo. il. 1913. **$5.50**

CONTENTS: PART I.—Elementary physics.—Matter, force, and motion. Special properties of matter Acoustics. Radiant energy: Heat, light. Magnetism. Electricity. Magneto-electric and dynamo electric generators Thermo-electric currents.

PART II.—Chemistry of the non-metals —Theoretical introduction. Hydrogen. The halogens. The oxygen group The nitrogen group. Boron. The carbon group. Classification of the elements.

PART III.—Chemistry of the metals.—The alkali metals. The alkaline earth group. The magnesium group The silver group The copper and mercury group Aluminum and the rare earths. The tin group. The bismuth group. The chromium group. The iron group. The platinum group

PART IV.—Organic chemistry.—Introductory. Open-chain or aliphatic hydrocarbons. Derivatives of the open-chain hydrocarbons. Closed-chain groups with less than six atoms of carbon Closed-chain or aromatic compounds. Isocyclic compounds containing one nucleus. Aromatic compounds with more than one nucleus. The alkaloids and ptomaines. The terpenes and their derivatives. Glucosides: Bitter and neutral principles Tissue-forming substances or proteid matter. Electrolysis and its applications. Appendix. Index.

SAKLATWALLA, B. D. Aluminothermic Reduction of Metals. American Chemical Society Monograph. Ready about July 1, 1922.

SANDEMANN, E. A. Earthenware. Notes on the manufacture of earthenware. 375 p. 12 mo. 1917. **$3.50**

SAUVEUR, ALBERT. Metallography and Heat Treatment of Iron and Steel. 486 p. 8 vo. il. 1918. **$7.00**

SAVAGE, W. G. The Bacteriological Examination of Food and Water. By W. G. Savage, B.Sc., M.D., D.P.H., County Medical Officer of Health, Somerset. Second edition. 200 p. 12 mo. il. 1917. **$2.50**

SCARD, FREDERICK J. The Cane Sugar Factory. 128 p. 12 mo. 1913. **$0.75**

SCHENCK, RUDOLPH and DEAN, R.S. Physical Chemistry of the Metals. 239 p. 8 vo. il. 1919. **$3.00**

The book is based on a series of lectures designed to show the application of physical chemistry to the study of smelting and metallurgical processes The translator has revised the numerical data to agree with the accepted values

CONTENTS Introduction, properties of metals Metallic solutions and alloys. Alloys of metals with carbides oxides, and sulphides, iron and steel, mattes, phase rule The metallurgical reactions, oxidation and reduction Decomposition of carbon monoxide, blast furnace process The reaction of sulphides.

SCHERER, R. Casein. Its Preparation and Technical Utilization. Translated from the German by Charles Salter. Second edition, revised and enlarged. 106 p 8 vo il. 1911. **$3.50**

CONTENTS. Casein, Its origin, preparation and properties, Various methods of preparing it, Its composition, Casein plants, Technics of casein painting, Adhesives and putties; Preparation of plastic masses from casein, Uses of casein in the textile industry, for finishing, color printing, etc., Casein foodstuffs; Sundry applications; Compounds, Recent patents granted for the improved manufacture and utilization of casein.

SCHIMPF, H. W. Manual of Volumetric Analysis. By Professor Henry W. Schimpf, Ph.G., M. D. Fifth edition. 725 p. 8 vo il. 1917. **$4.50**

Outlines chiefly pharmaceutical and food analysis. The volumetric processes described are those that have been tried and found of value.

SCHIDROWITZ, P. Rubber. Its Production and Industrial Uses. 320 p. 8 vo. il. 1911. **$6.00**

CONTENTS: Historical. Production and consumption of rubber. General nature of the rubber industry Wild rubber Plantation industry. Plantation system of the preparation of rubbers other than hevea Industrial rubbers Rubber latices and coagulation Crude rubbers compared Tackiness. Chemistry of crude rubber. Theory of vulcanization Manufacture of rubber goods. Substitutes and waste rubber disposal Chemical, physical and mechanical properties of vulcanized rubber. Chemical analysis and physical examination of rubber. Mechanical tests. Contracts and specifications.

SCHMIDT, WALTER KARL. Problems of the Finishing Room. 438 p. 8 vo. 1916. **$5.00**

A practical book covering a wide range of details for the production and application of stains, fillers, shellacs, varnishes, and waxes. Gives attention to fast to light anilines, and strives to develop "a better understanding of the artisan in the production of chemical solutions which make use of the natural color giving constituents ever present in wood." There are helpful suggestions for the construction of the finishing room, the equipment of the laboratory, the preparation of the wood, and the making of the fuming box. Many formulæ are included.

SCHIMPF, HENRY W. Essentials of Volumetric Analysis. Third edition. 366 p. 8 vo. 1911. **$2.50**

A practical guide for the work in the laboratory and an introduction to more advanced studies Subject matter is grouped under the headings of Neutralization, Precipitation Oxidation, Iodometry.

CONTENTS. General principles of chemical combination; Volumetric or standard solutions; Indicators, Apparatus, Calculating results; Analysis by neutralization, precipitation, oxidation and reduction; Estimation of alkaloids; Assaying of vegetable drugs, Estimations involving use of decinormal bromin V. S., Technical methods for fats, oils and waxes, Sugars; Formaldehyde; Alcohol, Nitrites, Hydrogen dioxide; Soluble carbonates, Urea.

SCHIMPF, HENRY W. A Systematic Course of Qualitative Chemical Analysis of Inorganic and Organic Substances. Third edition, revised. 187 p. 8 vo. 1917. **$1.75**

Contains most of the inorganic as well as organic qualitative reactions that a student of pharmacy is required to know

CONTENTS. Definitions and general considerations; Identification and separation of inorganic bases and acids, Metals; Alloys and hard metals, Table of solubilities, Acids, Qualitative analysis of organic substances; Behavior of organic substances with immiscible solvents; With Fehling's solution; Detection of the more common organic compounds; Detection of poisons; Preparation of reagents

SCHOELLER, W. R., and POWELL, A. R. The Analysis of Minerals and Ores of the Rare Earths. 239 p. 8 vo. 1920. **$5.00**

SCHON, H. A. v. Hydroelectric Practice. Second edition. 410 p. 8 vo. il. **$6.00**

CONTENTS: Part I.—Analysis of a hydro electric project The market Power opportunity. Feasibility and practicability. Cost of development. Value of project and presentation. Part II—Designing and constructing the development—The survey. Development program. Structural types. Equipment. Constructing the plant. Part III.—Operating and maintaining the plant.—The works. The equipment. Tables. General index.

SCHULTZ, GUSTAV, and JULIUS, P. Farbstoff-Tabellen. 1914. (Facsimile reprint.) 432 p. 8 vo. **$10.00**

SCHULTZ, G., and JULIUS, P. A Systematic Survey of the Organic Coloring Matters. Founded on the German of Drs. G. Schultz and P. Julius. Revised throughout and greatly enlarged by Arthur G. Green, F.I.C., F.C.S. 290 p. 8 vo. 1908. **$9.00**

SCHUSTER, A., and SHIPLEY, A. E. Britain's Heritage of Science.
334 p. il. 8 vo. 2nd edition, 1917. **$5.00**

CONTENTS: The ten landmarks of physical science; Physical science the heritage of the universities during the seventeenth and eighteenth centuries, Physical science- the non academic heritage during the seventeenth and eighteenth centuries; Physical science- the heritage of the nineteenth century, Physical science—some industrial applications, Physical science- scientific institutions, Biological science in the middle ages, Botany; Zoology; Physiology; Geology, Index.

SCHWEIZER, V. Distillation of Resins, Resinate Lakes and Pigments. Carbon pigments and pigments for typewriting machines, manifolders, etc. 191 p. 8 vo. 1905. **$5.00**

CONTENTS: Resins and Their Employment for Production of Chemical Products; Rosin, Hard Resins, Distillation of Hard Resins, Manufacture of Illuminating Gas from Rosin, Dry Distillation of Rosin, Rosin Oils, Nature of Crude Products, Rectification of Rosin Oil; Manufacture of Patent Lubricants, Rosin Soaps or Resinates, Manufacture of Resinate Varnishes, Of Lampblack and Lampblack Pigments; Lampblack Chambers, Of Printing Inks, Other Lampblack Inks, Inks for Typewriting Machines.

SCOTT, WILFRED W. (Editor). Standard Methods of Chemical Analysis. A manual of analytical methods and general reference for the analytical chemist and for the advanced student. Second edition, revised. 929 p. 8 vo. il. 1917. **$7.50**

(The following specialists have written chapters for this book H. A. Baker, L. C Barton, F G Breyer, B S. Clark, Wallace G Derby, Wm F Doerflinger, D K. French, H. A. Gardner, A H Gill, F. F Hale, R. F Hickman, W. B. Hicks, R. K Meade, J C. Olsen, R S. Owens, W. L Savell, J. A. Schaefer and W W Scott)

CONTENTS: Aluminum, Antimony, Arsenic, Barium, Bismuth, Boron, Bromine; Cadmium, Calcium, Carbon; Cerium and other rare earths; Chlorine; Chromium, Cobalt; Copper, Fluorine, Glucinum (Beryllium), Gold; Iodine, Iron; Lead; Magnesium, Manganese, Mercury; Molybdenum, Nickel; Nitrogen; Phosphorus, Platinum, Rarer elements of the allied platinum metals; Potassium; Sodium and other alkalies, Selenium and tellurium; Silicon; Silver, Strontium; Sulphur, Thorium, Tin, Titanium; Tungsten, Tantalum and Columbium, Uranium; Vanadium; Zinc; Zirconium; Acids, Water analysis, Oils, fats and waxes; Paints; Cement, Special alloys; Coal; Gas, Assaying of gold, silver, etc ; Useful data; Conversion tables; Table of melting points; Acid tables; Books of reference.

SCUDDER, HEYWARD. Electrical Conductivity and Ionization Constants of Organic Compounds. 575 p. 8 vo 1914. **$3.00**

Presents a bibliography of all the measurements of the ionization constants and the electrical conductivity of organic compounds that have appeared in the periodical literature between 1889 and 1910, inclusive, together with the values of the ionization constants and certain values of the electrical conductivity measurements, including also qualitative work. The work is divided into a set of tables arranged according to the names of compounds, containing all the data that may be given, with a bibliography of all of the references to each compound; a formula index to the compounds; a bibliography arranged according to names of authors; a subject index to certain subjects, and a journal list giving the names of all journals examined with the number and date of the last volume examined.

SEARLE, ALFRED B. An Introduction to British Clays, Shales, and Sands. 451 p. 12 mo. il. 1912. **$2.50**

CONTENTS Igneous rocks from which clays are derived. Formation of clays, etc, from igneous rocks. The sedimentary rocks. The clay forming portions of sedimentary rock How recent clay beds were formed. The chief characteristics of various clays and shales Materials similar to clay. Mineral and other constituents of clays The physical and chemical properties of clays. Prospecting, mining, and quarrying. The purification and preparation of clays. The legal position of clays. Appendix. Index.

SEARLE, A. B. Cement, Concrete and Bricks. 415 p. 8 vo. il. **$3.00**

CONTENTS: The raw materials for cements; Methods of cement manufacture; Chemical and physical changes in cements; Changes that occur in setting and hardening, Testing the properties of cements; The components of concrete and their properties; Preparation of concrete; Reinforced concrete, Special properties of concrete, Testing concrete; Raw materials for bricks; Methods of brickmaking, The chemical and other changes in drying and burning bricks; Basic and neutral bricks.

SEARLE, ALFRED B. Clays and Clay Products. (Pitman's Common Commodities and Industries) 163 p. il. 1920. **$1.00**

CONTENTS Formation of clays, Varieties of clays; The winning of clays; Prospecting and boring; Mining and quarrying; Preparing the clay, Weathering, Purifying clays, Crushing and grinding, Tempering and pugging; Clay slips and their uses, Bricks, Tiles, Terra cotta; Coarse pottery and sanitary ware, Stoneware and drain pipes; Line earthenware, Porcelain (including chinaware and chemical ware); Refractory materials (including retorts, firebrick, furnace linings and crucibles and glass poto); Portland cement, Ultramarine and other chemicals

SEARLE, A. B. Kilns and Kiln Building. 504 p. 8 vo. 1915. **$2.00**

SEARLE, ALFRED B. Modern Brickmaking. Second edition, revised and enlarged. 510 p. 310 il. 8 vo. 1920. **$7.00**

CONTENTS. The nature and selection of clays; Their special suitability for certain purposes; The colors and characteristics of various bricks, Sand, breeze and other materials used; The general manufacture of bricks; Hand brickmaking processes; Plastic moulding by machinery; Wire-cut bricks; Mixers and feeders; Expression rolls; Pug mills, mouthpiece presses and auger machines; Cutting tables; Represses; Dryers; The stiff plastic process, The semi-dry or semi-plastic process; The dry or dust process, Kilns-setting and burning; Vitrified brick for special work; Fire-bricks and blocks; Glazed bricks; Perforated, radial, and hollow bricks and blocks; Fire-proof flooring; Moulded and ornamental bricks; Drying raw clay; Sources of difficulty and loss.

A complete treatise on the whole industry, in which is condensed into convenient limits the results of a wide practical experience with all the better known processes, machines and kilns now in use.

SEARLE, ALFRED B. Refractory Materials: Their Manufacture and Uses. 444 p. 8 vo, il. 1917. **$[illegible].00**

"The purpose . . . is to summarize, in convenient form, the chief materials and products used in the construction of furnaces, etc., and to describe the manufacture and properties of firebricks, retorts, crucibles, etc., used in the metallurgical, engineering, chemical and other industries No other book published in this country [England] is devoted solely to this important subject. It is intended to supply the user of refractory materials with the main properties of the materials and products available to him, whilst the manufacturer will also find detailed descriptions of the raw materials, the methods of preparation, manufacture and use. The appendix contains specifications used by various authorities and sundry tables relating to temperature."—*Preface.*

SEARLE, ALFRED B. The Clayworker's Handbook. Third edition, revised and rewritten. A manual for all engaged in the manufacture of articles from clay. 416 p. 12 mo. il. 1919. **$6.50**

CONTENTS: The materials used in clayworking. Preparation of the clay Machinery transport: Conveyors, pumps and fans. Drying and dryers. Engobing and glazing Setting or charging Kilns. Firing Discharging Sorting, packing and despatching Defects. Waste. Tests, analysis, and control. Useful tables. Index.

SEELIGMANN, T., TORRILHON, G. L., and FALCONNET, H. India Rubber and Gutta-percha. Translated by J. G. McIntosh. A complete practical treatise on india rubber and gutta percha in their historical, botanical, arboricultural, mechanical, chemical and electrical aspects. Second English edition, revised and enlarged. 424 p. 8 vo. il. 1910. **$6.00**

CONTENTS INDIA RUBBER. Botanical Origin Climatology Soil. Rational Culture and Acclimation of the Different Species of India-rubber Plants. Methods of Obtaining the Latex Methods of Preparing Raw and Crude India rubber Classification of the Commercial Species of Raw Rubber Physical and Chemical Properties of the Latex and of India rubber. Mechanical Transformation of Natural Caoutchouc into Washed or Normal Caoutchouc (Purification) and Normal Rubber into Masticated Rubber. Softening, Cutting, Washing, Drying Preliminary Observations. Vulcanisation of Normal Rubber Chemical and Physical Properties of Vulcanised Rubber General Considerations. Hardened Rubber or Ebonite Considerations on Mineralisation and other Mixtures Coloration and Dyeing Analysis of Natural or Normal Rubber, and Vulcanised Rubber Rubber Substitutes. Imitation Rubber. GUTTA-PERCHA Botanical origin Climatology. Soil. Rational Culture. Methods of Collection Classification of the Different Species of Commercial Gutta percha Physical and Chemical Properties. Mechanical Transformation. Methods of Analyzing Gutta-percha Substitutes.

SEGERBLOM, WILHELM. Tables of Properties of Over Fifteen Hundred Common Inorganic Substances. Second edition revised. 144 p. 8 vo 1916. **$3.00**

CONTENTS: Sodium; Potassium; Lithium, Ammonium; Barium; Strontium; Calcium; Magnesium, Aluminum, Chromium; Iron; Cobalt, Nickel, Manganese; Zinc, Silver; Lead; Mercury; Copper, Cadmium, Bismuth, Arsenic; Antimony; Tin.

SEIDELL, ATHERTON. Solubilities of Inorganic and Organic Substances. Second edition, revised and enlarged. 843 p. 8 vo. 1919. **$7.50**

Compiled from data in the periodical literature. Author is Chemist in the Public Health and Marine Hospital Service.

SELLEW, WILLIAM H. Steel Rails, Their History, Properties, Strength and Manufacture. With notes on the principles of rolling stock and track design. 575 p. 4 to. il. 1913. **$10.00**

(Author is principal assistant engineer, Michigan Central Railroad.)

CONTENTS: *Development of the Present Section.* Early Sections. Present Sections. *Pressure of the Wheel on the Rail* Speeds of Modern Locomotives Weights of Modern Locomotives. Effect of Excess Balance and Angularity of the Main Rod Effect of Irregularities in the Track Effect of Rocking of the Engine Effect of Flat Spots in the Wheels. Impact Tests. The Dynamic Augment of the Wheel Load Electric Locomotives. Cars. *Supports of the Rail* The Tie. Bearing of the Rail on the Tie Fastening of the Rail to the Tie. Strength of the Tie Bearing on the Ballast Bearing on the Subgrade Supporting Power of the Tie *Stresses in the Rail.* Stresses at Point of Contact of the Wheel with the Rail. Proposed Solutions of the Bending Stress in the Rail. Tests to Determine the Bending Stress in the Rail. Calculation of the Bending and Shearing Stress in the Rail. Effect of the Joint *Strength of the Rail.* Influence of Stress and Strain on the Strength of the Rail. Effect of Low Temperature on the Strength of the Rail Physical Tests of the Strength of the Rail The Strength of the Rail and Proper Weights for Various Conditions of Loading *Influence of Detail of Manufacture* Chemical Composition. Extraction of the Iron from its Ore. Conversion of the Steel Casting the Ingot. Influence of Mechanical Work *Rail Specifications* Comparison of American Specifications. Specifications of the New York Central Lines Specifications for Rails Rolled for Export British Standard Specifications of Bull Headed Railway Rails British Standard Specifications of Flat Bottom Railway Rails Specifications for Street Railway Rails. Bibliography of Rail Specifications Appendix, Reports and Records

SERGEANT, E. W. Centrifugal Pumps and Suction Dredgers. 188 p. 8 vo. il. 1916 **$4.50**

The advance in the design, construction and applications of all classes of centrifugal pumping machinery necessitates a complete book on the subject This presents the modern information desired by draftsmen, designers and engineers responsible for the manufacture, irrigation Centrifugal sewage pumping machinery. Centrifugal pump-

CONTENTS: Historical Fundamental principles underlying the action of centrifugal pumps. Principles of design The disc Forms of pump casings. Pattern-making. Moulding-machining. Description of various types of pump casings shown in figures. Pumps in series. Parallel centrifugal pumps Pumps of high capacity on low heads. Charging apparatus. Testing of centrifugal pumps. Piping arrangements and valves. Centrifugal pumping machinery for drainage and irrigation. Centrifugal sewage pumping machinery. Centrifugal pumping machinery for docks. Centrifugal pumps for salvage of wrecks. Centrifugal fire pumps. Centrifugal pumps driven by steam turbines. Rotary air pumps. Pumps for dredging and conveying solids. Cutter gear. Dredgers of simple design. Transporter dredgers. Appendix: Dimensions, horse-powers, discharges. Cost. Prices, etc. Index.

SEXTON, A. H., and PRIMROSE, J. S. G. Outline of the Metallurgy of Iron and Steel. Second edition. 572 p. 8 vo. il. 1912. **$6.50**

SEYMOUR, ALFRED. Modern Printing Inks. A practical handbook for printing ink manufacturers and printers. 90 p 8 vo. il. 1910. **$3.00**

CONTENTS: Linseed oil; Varnish; Dry colors; Blacks, whites, yellows, reds, browns, blues, greens, lakes. The grinding of printing inks; Inks and color mixing; The characteristics of some printing processes; Driers; Bronze powders and bronzing; Things worth knowing

SHERMAN, H. C. Chemistry of Food and Nutrition. By Henry C Sherman, Ph D., Professor of Food Chemistry in Columbia University. 355 p. 8 vo. 1916. **$2.40**

The purpose of this volume is to present the principles of the chemistry of food and nutrition with special reference to the food requirements of man and the considerations which should underlie our judgment of the nutritive values of food. The food is here considered chiefly in its nutritive relations.

While neither the size nor the purpose of this book would permit an historical or technically critical treatment, a limited number of historical investigations and controverted views have been mentioned in order to give an idea of the nature and validity of the evidence on which our present beliefs are based, and in some cases to put the reader on his guard against theories which, while now outgrown, are still sometimes encountered.

SHERMAN, H. C. Methods of Organic Analysis. By Henry C. Sherman, Ph.D., Professor of Food Chemistry in Columbia University. 407 p. 8 vo. 1917 **$3.00**

A discussion of the systematic treatment of the subject of Organic Analysis with reference especially to plant and animal substances and their manufactured products The topics selected are those which will best illustrate the fundamental principles and processes of Organic Analysis and at the same time familiarize the student with the natural and industrial products, the analysis of which is most often required in practice Special attention has been given to solid and liquid fuels, industrial alcohol, crude petroleum, aldehydes, sugars, proteins, and food preservatives.

SHERMAN, H. C., and SMITH, S. L. The Vitamins. American Chemical Society Monograph. About 500 p. il. Ready about February 1, 1922.

CONTENTS: Historical introduction, Terminology; The three vitamins: Physical and chemical properties, occurrence in foods, functions storage in the body, general significance in nutrition; Adequacy of American food supplies

SHREVE, R. NORRIS. Dyes Classified by Intermediates. To be published by The Chemical Catalog Co, Inc. About 300 p. Ready, November, 1921.

CONTENTS: Intermediates; Formulas, Molecular weights, Production statistics, Dyes, Intermediates used; Classification by use, Classification by intermediates; Trade names.

SIBLEY, R., and DELANY, C. H. Elements of Fuel Oil and Steam Engineering. A practical treatise dealing with fuel oil for the central station man, the power plant operator, the mechanical engineer and the student Second edition. 446 p. 8 vo. il. 1921. **$5.00**

SILVERMAN, ALEXANDER, and others. Glass Manufacture. About 1000 p. 8 vo. il. (To be published by The Chemical Catalog Co, Inc.) **In Preparation**

A complete treatise on the manufacture of all kinds of glass as carried on in the United States, including the recent important advances in glass technology made under the influence of the war. Every phase of the modern glass industry is dealt with in a practical manner including complete information with regard to the raw materials of the glass industry and the construction of modern glass making machinery. The author, who is head of the Department of Chemistry at the University of Pittsburgh, has been prominently identified with the glass industry for many years, and is being assisted in the preparation of this book by several other experts, who are contributing special chapters.

CONTENTS History; Clays and refractories: Furnaces and lehrs; Air compression systems, Electrical equipment, Gas producers; Producer gas vs natural gas; Other fuels, Raw materials, Coloring agents; Calculations; Composition; Preparation of the batch, Melting and refining; Furnace control (pyrometry), Working the glass; Annealing, Physical and chemical properties; Plate glass, Window glass, Wire and reinforced glass; Bottle glass, Chemical, vacuum and cooking ware; Table ware and cut glass; Art glass, Illuminating ware, Electric bulbs (including X-ray); Physical color analysis, Applications of illuminating engineering; Optical glass; Spun glass, Buttons and rod ware; Etching and sand blasting; Silvering—Metallic coatings, Glass substitutes, Decorative processes, Fused quartz, Labor and costs; Packing and shipping; Tables.

SIMMONS, H. E. Rubber Manufacture. 156 p. 4 to. 60 il. 1921. **$4.50**

The cultivation, chemistry, testing and manufacture of rubber, with sections on reclamation of rubber and the manufacture of rubber substitutes. The entire rubber industry is completely discussed and the technical features of the subject presented so as to be of value to students and manufacturers

CONTENTS The history of Caoutchouc; Rubber of the Amazon Basin; African rubbers, including those from Madagascar, Central American rubbers; Rubber plantations and their development; Discussion of colloids; Colloidal action of crude rubber and its application to rubber manufacture; Different means of coagulation; Theory of the constitution of rubber; Synthetic Caoutchouc; Chemical and physical testing of crude rubber, The manufacture and use of inorganic fillers; The manufacture and use of organic accelerators, The manufacture and use of rubber substitutes; Theory of vulcanization, Methods of reclaiming rubber; Preparation of crude rubber for manufacturing; The principles of compounding; Chemical analysis of manufactured rubber; Physical testing of compounded samples; Appendix; The laboratories and equipment of the Municipal University of Akron.

SIMMONS, WILLIAM H. Soap: Its Composition, Manufacture, and Properties. (Pitman's Common Commodities and Industries.) 124 p. il. 12 mo. 1920. **$1.00**

CONTENTS: Introduction; Raw materials; Methods of soap-making: Toilet soap; Soap powders, Textile soaps, The properties; Detergent action and commercial valuation of soap; Glycerine.

SIMON, WILLIAM, and BASE, D. Manual of Chemistry. Eleventh edition, revised. 648 p. 8 vo. 1917. **$7.20**

SINDALL, R. W. The Manufacture of Paper. 285 p. 12 mo. il. 1908. **$3.00**

CONTENTS Historical notice Cellulose and paper making fibres. The manufacture of paper from rags Esparto and straw. Wood pulp and wood pulp papers Brown papers and boards Special kinds of paper Chemicals used in paper making The process of "beating." The dyeing and coloring of paper pulp. Paper mill machinery. The deterioration of paper. Bibliography of works relating to cellulose and paper making.

SKINNER, EDMUND N., and PLATE, H. R. Mining Costs of the World. 406 p. 12 mo. 1915. **$5.00**

An engineer's and operator's pocket book, giving the production, costs and operating data of about 325 of the principal metal mines of the world It contains a thorough compilation of operating results taken from the annual reports of mining companies and other reliable sources.

SLOANE, T. O'CONOR. Liquid Air and the Liquefaction of Gases. Third edition, revised and enlarged. 394 p 12 mo. il. 1920. **$3.00**

CONTENTS: Physics Heat Heat and Gases Physics and chemistry of the air Royal Institution Michael Faraday Early experimenters Raoul Pictet Cailletet Wroblewski and Olszewski. James Dewar. Tripler Joule Thomson effect Linde apparatus. Applications of low temperatures Claude and Linde. Utilization of atmospheric gases, helium, argon

SLOSSON, EDWIN E. Creative Chemistry. 300 p. 8 vo. il. 1919. **$3.00**

CONTENTS: Nitrogen, Feeding the soil; Coal tar colors, Synthetic perfumes and flavors, Cellulose, Synthetic plastics, The race for rubber, The rival sugars, What comes from corn, Solidified sunshine, Fighting with fumes, Products of the electric furnace; Metals, old and new.

SMITH, ALEXANDER. Introduction to Inorganic Chemistry. Third edition, rewritten. 925 p. 8 vo. 1917. **$3.75**

CONTENTS: Chemical phenomena and the methods of studying and classifying them, Energy in chemical change, Physics in practical chemistry, Combining proportions by weight, Symbols, Formulas, Equations, Calculations, Oxygen; Measurement of quantity in gases; Hydrogen, Water; Relations between the structure and behavior of matter, The kinetic molecular viewpoint; Solution, Hydrogen chloride and Chlorine, Molecular weights and atomic weights, Applications of molecular and atomic weights; Properties of atoms; The halogen family, Chemical equilibrium, Ozone and hydrogen peroxide; Dissociation in solution; Ionization, Ionic substances and their interactions; Sulphur and hydrogen sulphide; The oxides and oxygen acids of sulphur; Selenium and tellurium; The classification of the elements; Oxides and oxygen acids of the halogens; Oxidation and reduction, The atmosphere; The helium family; Nitrogen and its compounds with hydrogen; Oxides and oxygen acids of nitrogen; Phosphorus; Carbon and the oxides of carbon, The hydrocarbons; Illuminants; Flame, The carbohydrates, organic acids, alcohols, soap, colloids, foods; Silicon and boron; The base forming elements, Metallic elements of the alkalies; Potassium and ammonium; Sodium and lithium; Ionic equilibrium considered quantitatively; Metallic elements of the alkaline earths, Calcium, strontium, barium; Copper, silver, gold, Magnesium, zinc, cadmium, mercury, The recognition of the cations in qualitative analysis; Electromotive chemistry; Aluminium and metallic elements of the earths; Germanium; Tin, lead, arsenic, antimony, bismuth; The chromium family; Radium; Manganese, Iron, cobalt, nickel, The platinum metals. Appendix.

SMITH, A. W. Principles of Electric Measurement. 243 p. 12 mo. il. 1914. **$2.25**

SMITH, EDGAR F. Chemistry in America. Chapters from the history of the science in the United States. 369 p. 8 vo. il. 1914. **$3.00**

CONTENTS: Contributions of America to chemistry; The Chemical Society of Philadelphia, James Woodhouse, Joseph Priestley, Thomas Cooper, John MacLean at Princeton, Robert Hare; Silliman's second visit to Philadelphia, Columbian Chemical Society founded in 1811; Leading chemists as mineralogists, Other eminent chemists

SMITH, EDGAR F. Electroanalysis. Sixth edition, revised and enlarged. 47 il. 8 vo. 357 p 1918. **$3.50**

CONTENTS. Sources of electric current, Magneto electric machines, dynamos, thermopile, storage cells, Reduction of the current, Rheostats, resistance frames, Measuring currents voltameter, voltmeter, amperemeter; An electro chemical laboratory, Historical sketch, Theoretical considerations; Rapid precipitation of metals in the electrolytic way, Use of mercury cathode; Determination of metals, Separation of metals, Additional remarks on metal separations, Determination of the halogens in the electrolytic way, Special application of the rotating anode and mercury cathode in analysis, Oxidations by means of the electric current, The combustion of organic compounds.

SMITH, ERNEST A. The Sampling and Assay of the Precious Metals. Comprising gold, silver, platinum, and the platinum group metals in ores, bullion, and products. 460 p. 8 vo. il. 1913. **$6.00**

In the preparation of this work the aim has been to provide a full description of the various methods of sampling and assaying—both by the dry and wet methods- the precious metals contained in ores, bullion, and metallurgical products, and to produce a book useful alike to the student and to the assayer in practice Special attention has been devoted to sampling, which the author considers of great importance.

SMITH, ERNEST A. The Zinc Industry. 231 p. 8 vo. il. 1918. **$3.75**

CONTENTS: The history of zinc, The rise and progress of the production of zinc, Zinc ores and their sources of supply; The marketing of zinc ores; The smelting of zinc ores, Other methods of zinc production; The physical and chemical properties of zinc; The marketing of zinc; The industrial applications of zinc; Industrial zinc alloys; Commercial compounds of zinc; Zinc pigments.

SMITH, HENRY C. Lecture Notes on Chemistry for Dental Students; including dental chemistry of alloys, amalgams, etc., such portions of organic and physiological chemistry as have practical bearing on the subject of dentistry. An inorganic qualitative analysis with specially adapted blowpipe and microscopical tests, and the chemical examination of urine and saliva. By H. Carlton Smith, Ph.G., Lecturer on Physiological and Dental Chemistry at Harvard University Dental School, etc. Third edition, revised and enlarged. 455 p. 8 vo. il. 1917. **$4.00**

SMITH, J. C. Manufacture of Paint. Second edition 300 p. 8 vo. 1917. **$5.00**

Contents: Definitions Storing and handling raw materials. Testing and valuation of raw material. Plant and machinery. Grinding of white pigments Grinding of earth pigments Grinding of oxide of iron pigments. Grinding of chemical pigments. Grinding in water, in turpentine, gold size and special mediums Mixed or prepared paints Enamels and enamel paints Designing, testing and matching of paints. Economic and general considerations. Index.

SMITH, J. REGINALD. Modern Assaying. A concise treatise describing the latest methods and appliances. Edited by F. W. Braun. 145 p. 8 vo il 1910 **$1.50**

The aim of this book is to present in an intelligible and non technical manner the science and methods of assaying It is especially intended for the busy man whose time has been and is so occupied with other duties that it is impossible for him to devote his attention to technical works on assaying, and to the man who desires an insight into the practical methods of assaying in the shortest time possible.

Contents Selection and preparation of sample Fire assay for gold and silver. Scorification assay Assay of gold bullion Fire assay of lead. Fire assay of antimony. Weighing Fluxes. Touch stone and test needles. Volumetric determination of copper with solution of potassium cyanide Modification of Kerl's Swedish copper assay. Electrolytic assaying with the Guess Haultain electrolytic outfit Wet assay of lead Volumetric determination of lead by the molybdate method. Distilled water. Mercury determination of distillation. Whitton's method of mercury determinations Retorting amalgam and melting bullion. Care of muffle and furnace. Accidents. Ozone. Reference tables and information.

SMITH, ROBERT H. The Calculus for Engineers and Physicists. Second edition. 207 p. 8 vo. il. 1908 **$3.00**

Contents: Part I.- Introductory. General ideas and principles. Algebraic and graphic symbolism. Easy and familiar examples of integration and differentiation. Important general laws Particular laws. Transformations and reductions. Successive differentiation Important general laws. Particular laws Transformations and reductions Successive differentiation and multiple integration Independent variables. Maxima and minima. Integration of differential equations Part II – Classified reference tables of integrals and methods of integration in eleven sections. Notation. General theorems Methods of transformation. Tables of integrals Reduction formulæ. Differential equations.

SMITH, ROBERT H. Commercial Economy in Steam and Other Thermal Power-Plants. 315 p. 8 vo. 1905. **$7.00**

Contents: Introductory Products, profit, and economy. Commercial economy co efficient. Dynamic and thermal action Physical data. Furnace, boiler, and engine efficiencies Costs. Capital outlay and working expenses. Steam, gas, and oil plants Electric power stations. Depreciation Kinetic energy and resilience Kinetic transpower and resilient transpower. Irreversibility and heat transpower. Stress and strain specific heats. Analysis into thermal and mechanic elements Dynothermic co efficient First adjustment of size for maximum economy Dynothermic co-efficients of steam, work, heat, and costs of actual indicator diagrams Partial limit values of bulk, initial pressure, and back pressure of maximum commercial economy Combinations of best values for maximum commercial economy. Furnace temperature and working speed for maximum economy.

SMITH, W. Chemistry of Hat Manufacturing. Revised and edited by Albert Shonk. 131 p. 12 mo. 1912. **$3.50**

Contents: Textile fibres, principally wool, fur and hair; Water, its impurities and their action, Acids and alkalies; Boric acid; Borax; Soap; Shellac; Wood spirit; Stiffening and proofing process; Mordants: Dyestuffs and colors; Dyeing of wool and fur; Optical properties of colors.

SMYTHE, J. A. Lead. (Pitman's Common Commodities *and* Industries.) 120 p. il. 12 mo. 1920. **$1.00**

Contents History of lead; Lead ores, Their method of occurrence and mineral associates, The finding and mining of lead ore and the preparation of the ore for smelting; The chemical changes involved in smelting, Smelting in the ore hearth; Smelting in the reverberatory furnace; Smelting in the blast furnace; Condensation of lead fume; Softening and desilverization of work lead, Cupellation of alloys of silver and lead; Properties and uses of lead and its alloys; Compounds of lead litharge and red lead, White-lead and other lead pigments, Lead in medicine, and lead poisoning.

SNOW, CHARLES HENRY. Wood and Other Organic Structural Materials. 478 p. 8 vo. il. 1917. **$5.00**

For engineers, architects, technical students, and teachers of manual training. Of its 478 pages, 376 are devoted to wood, its classification, properties, and descriptions of the various species, with chapters on failures and means of preservation. The last three chapters relate to oils, paints, varnishes, adhesives, and india rubber. Bibliographies, p. 437 445. Author is Dean of the School of Applied Science, New York University

SOLOMON, HENRY G. Electricity Meters. A treatise on the general principles, construction, and testing of continuous current and alternating current meters, for the use of electrical engineers and students. 332 p. 8 vo. il. 1906. **$5.00**

Although the electricity meter forms the most important link in the chain connecting the supply station with the consumer, comparatively little has been written on the subject. The present work may supply what is wanting in this respect; some original matter may be found, especially in connection with the limitations of three-wire meters, of single-phase meters for polyphase circuits, and the results obtained with polyphase meters incorrectly installed.

No pains have been spared to make each chapter as comprehensive and complete as practicable within the scope of the book, and to separate the mathematical principles from the purely descriptive matter. The latter is not possible, however, in treating polyphase meters.

Contents: Introductory and general remarks. General principles of continuous current meters. Continuous current quantity meters. Continuous current energy motor meters. Continuous current energy meters of different types Continuous current meters for special purposes General principles of single phase and polyphase induction meters. Single-phase induction meters Polyphase meters. Tariff systems. Prepayment meters. Tariff and hour meters. Some mechanical features in meter design. Meter testing. Appendix. Index.

SOMERMEIER, E. E. Coal; its composition, analysis, utilization and valuation. 175 p. 8 vo. il. 1912. **$2.50**

Contents: I.—Composition and heating value. II.—Chemical analysis of coal. III.—Sampling IV.—Methods of analysis. V.—Determining the calorific value VI.—Summary of chemical determination of records. VII.—Improvement of coal by washing. VIII.—Purchase of coal under specifications. IX.—Flue gas analysis. X.—Analytical tables.

SORSBIE, R. F. Geology for Engineers. 423 p. 8 vo. il. 1911. **$3.75**

Contents: Part I.—Dynamical and structural geology. Chapter I Changes on the earth's surface Chapter II—Changes within the earth Chapter III.- Structural characters of rocks. Part II.—Rocks and minerals. Chapter IV The study of minerals. Chapter V. Rock forming minerals Chapter VI -The study of rocks Chapter VII – Rocks Part III - Historical geology. Chapter VIII.—Principals of stratigraphy and palæontology Chapter IX—The Geological systems. Part IV.–Geological observation Chapter X—Outdoor work. Chapter XI Indoor work Part V—Practical Geology. Chapter XII Water supply. Chapter XIII—Building stones. Chapter XIV - Bricks and clays Chapter XV—Limes, cements, and plasters Chapter XVI Roads and canals Chapter XVII – Rivers Chapter XVIII.- Coast erosion Chapter XIX—Uses of minerals. Index.

SOSMAN, ROBERT B. The Properties of Silica and the Silicates. About 500 p 8 vo il Ready about December 1, 1921. American Chemical Society Monograph.

Contents: Silica, Physical and Chemical Properties, Silica, Natural Occurrence and Industrial Uses; Alumina, Magnesia, and Lime; Oxides of Iron; General Properties of 2-Component Systems of the Common Oxides; The System SiO_2 Al_2O_3, Clays, The System SiO_2: MgO, The System SiO_2 CaO, Sand lime brick; The Systems SiO_2 Na_2O and SiO_2 K_2O; The Systems Al_2O_3 MgO: :Al_2O_3 CaO, and MgO CaO, Spinels and spinel refractories; The Systems MgO.Fe_2O_3 and CaO: Fe_2O_3. Magnesite brick, General Properties of 3 Component Systems of the Common Oxides, The System SiO_2 Al_2O_3 MgO; The System SiO_2 Al_2O_3·CaO, Portland cement; The System SiO_2·Al_2O_3:K_2O, Potash feldspars, The Systems SiO_2 CaO·Na_2O and SiO_2·CaO·K_2O, Common glass; The System SiO_2 CaO·FeO, Copper slags, Etc; General Properties of 4 Component Systems of the Common Oxides; The System SiO_2·Al_2O_3 MgO CaO, Blast furnace slags; The System SiO_2·Al_2O_3 Na_2O:K_2O, Porcelain; Etc.; General Properties of Silicate Glasses, Silicate of the Rarer Elements; Silicates of Li, Rb, and Cs; Silicates of Sr and Ba, Silicates of Zn and Cd; Borosilicates; Titanosilicates, Silicates of Mn, Ni, Co, and Cu; Silicates of Pb and Tl; Silicate Systems Containing Water; Colloidal Silica; Hydrated Silicates; Silicate Rocks.

SOUTHCOMBE, J. E. Chemistry of the Oil Industries. 209 p. 8 vo. il. 1913. **$3.50**

Contents Introductory organic chemistry. Mineral oils Petroleum and shale mineral oil refining Natural sources and methods of preparation of saponifiable oils and fats Impurities occurring in crude oils and fats and the technical methods of removing them. Composition and properties of the saponifiable oils and fats in general. Composition and properties of the individual oils and fats of commercial importance The natural waxes, their composition and properties Analytical methods Industrial applications of fats and oils. Burning oils Edible oils and margarines. Polymerised, boiled and blown oils Turkey red oils. Saponification of fats and oils on a technical scale. The distillation of fatty acids Oleines and stearines. Candle manufacture. Soap-making Glycerine. Conclusion. Scientific and technical research on problems in the oil and related industries. Literature.

SPENCER, G. L. A Handbook for Cane-Sugar Manufacturers and Their Chemists. By Guilford L. Spencer, D.Sc., Chief Chemist in Charge of Manufacture, Cuban-American Sugar Co. Sixth edition, enlarged. 561 p. 16 mo. il. 1917. Flexible "Fabrikoid" binding. **$4.00**

An outline of the processes of the manufacture of cane-sugar from the cutting of the raw material to the last operation in the warehouse, together with methods of sugar analyses.

Contents: Manufacture of cane-sugar Extraction of the juice. Purification of the juice Filtration of the juice and scums Chemical reagents used in purifying the juice Evaporation of the juice. Preservation of the juice and sirup Crystallization of the sugar. Curing the sugars. Composition of the sugar-cane and molasses. General analytical work.

SPENCER, G. L. A Handbook for Chemists of Beet-Sugar Houses. By Guilford L. Spencer, D.Sc. 475 p. 16 mo. il. 1910. Flexible "Fabrikoid" binding. **$4.00**

Treats of seed-culture farms and contains selected methods of analysis, sugar-house control, reference tables, etc.

Contents: Sugar house control. Weights and measures. Estimation of losses of sucrose Sugar analysis. Sampling and averaging. Density determinations. Analysis of the beet, juice, sirup, massecuites and molasses, sugars, filter press cake, filter residues, wash and waste waters, exhausted cosette. Coefficients and terms used in sugar analysis. Determination of the marc. Viscosity of sugar-house products. Control of the osmosis process. Analysis of the saccharates. Examination of bone-black Analysis of the lime-kiln and chimney-gases. Analysis of limestone, lime, sulphur, coke, lubricating oils, water. Seed selection and testing.

SPENCER, GUILFORD L. Manual de Fabricantes de Azúcar de Caña. Traducción Autorizada de la 6a Edición Ingliss, Por el Dr. Gaston Alonso Cuadrado, Director de la Escuela Azucarera de la Habana. 617 páginas. 8 vo. 97 grabados. Ribete flexible "Fabrikoid." **$5.00**

El desarrollo extraordinario que ha tomado la industria en los paises Hispano-Americanos impone desde hace tiempo la necesidad de publicar una edición española del libro del Dr. Guilford L. Spencer, porque no existe libro alguno en nuestra idioma que embarque en sus páginas de un modo conciso y sentético el desarrollo de la manufactura en todas sus fases desde que se siembra la planta hasta que se halla envasado el producto y dispuesto para el consumo.

SPENCER, L. J. The World's Minerals. 327 p. 8 vo. 1911. $3.00

SPENCER, JAMES P. Metals of the Rare Earths. 279 p. 8 vo 1919. $4.50

Contents: History of the discovery of the rare earths Occurrence of the rare earths in nature Separation of the rare earths. Methods of controlling the fractionation of the rare earths The Cerium group of rare earths. The Yttrium group of rare earths. Thoium. Atomic weight determinations Rare earths and the Periodic System. Uses of the rare earths. References Refererce index Name index Subject index.

SPRINGETT, B. H. Cold Storage and Ice-Making. (Pitman's Common Commodities and Industries) 122 p. il 1921. $1.00

Contents: Introduction, Terms used in mechanical refrigeration, Principles of mechanical refrigeration, Ammonia compression refrigerating machines, The ammonia condenser or refrigerator or evaporator; Brine, Insulation, Other systems of mechanical refrigeration; Ice making; The cold store, Applications of mechanical refrigeration, The frozen-meat trade.

STANDAGE, H. C. Agglutinants of All Kinds for All Purposes. 267 p. 8 vo. 1907. $3.50

Contents: Resinous cements, Agglutinants of different kinds for use by carpenters, painters, decorators, bricklayers, plasterers and stonemasons, Agglutinants adapted for use in paper, printing, photographic, leather and kindred trades, Compounds used in textile industries; Cements for the metal workers, Notes on the materials used.

STANDAGE, H. C. Cements, Pastes, Glues, and Gums. A practical guide to the manufacture and application of the various agglutinants required in the building, metal, wood and leather trades, etc. With upwards of nine hundred recipes and formulas. 171 p. 16 mo. 1916. $1.25

Contents: Hints on the application of cements, Acid, spirit and water-proof cements, Building cements, plasters, etc, Cements and pastes for chemists, electricians, naturalists, etc, Cements for china, glass and earthenware, Cements and glues for the leather trades; Cements for the metal workers' use, For wood workers, Glues for various purposes; Office paste, gums and wafers; Miscellaneous recipes.

STANDAGE, H. C. Leatherworkers' Manual. Second Edition. 175 p. 8 vo. 1900. $4.50

Contents Blackings, Polishes, Glosses, Dressings, Renovators, etc. for Boot and Shoe Leathers, Harness Blackings, Dressings, Greases, Compositions, Soaps, and Boot Top Powders and Liquors, Leather Grinders' Sundries; Curriers Seasonings, Blacking Compounds, Dressing Finishes, Glosses; Dyes and Stains for Leathers; Chrome Tannage; Useful information.

STANDAGE, H. C. Sealing Waxes, Wafers, and Other Adhesives. For the household, office, workshop and factory 96 p. 12 mo. 1903. $2.50

Contents: Sealing waxes and their manufacture, Wafers, Notes on the nature of the materials used in making adhesive compounds; Cements for use in the household, Office gums, pastes and mucilages, Adhesive compounds for factory and workshop use.

STANSFIELD, ALFRED. The Electric Furnace, its evolution, theory and practice. 415 p. 8 vo. il. 1914. $5.00

The first edition of this work met with much favor In the present edition the author covers the great advance in practice and equipment It is three times as large as the first edition It is a full statement of present-day practice.

Contents: I.—Historical II—Description and classification of electric furnaces. III.—Efficiency of electric and other furnaces, and relative cost of electrical and fuel heat IV—Construction and design. V.—The operation of electric furnaces VI Laboratory furnaces. VII—The production of pig iron in the electric furnace VIII—The production of steel from metallic ingredients. IX The production of steel from iron ore X—The ferro alloys and silicon XI—Graphite and carbides XII.—The electric smelting of zinc and other metals. XIII—Miscellaneous uses of the electric furnace. XIV.—Electrolysis and electrolytic processes. XV.—Future developments of the electrical furnace.

STECHER, GILBERT E. Cork; Its Origin and Industrial Uses. 94 p. 8 vo. il. 1914. $1.00

Contents: Quercus suber (cork); Quercus liber (linnaeus), Cork, Origin, including the territory of growth and attempts to transplant the seed; The tree and growth, Diseases; Stripping, Botany and chemistry, including compression diagram; Uses and application, Substitutes; Manufacture, Raw stock, sorting, stopper making, cork disc making, waste utilization; Extent of the manufacturing industry

A concise, plain story of the corkwood stopper about which there seems to be no written information extant In the discussion of the origin of cork the author details the territory in which corkwood grows and explains the various attempts that have been made to transplant the seed. The tree, its growth and diseases are explained, and the uses, application and substitutes for the corkwood are taken up in detail. The methods of manufacture and the utilization of waste receive generous treatment.

STEDMAN, THOMAS L. A Practical Medical Dictionary; words used in medicine with their derivation and pronunciation. Fourth revised edition. Including dental, veterinary, chemical, botanical, electrical, life insurance and other special terms; anatomical tables of the titles in general use, and those sanctioned by the Basle Anatomical Convention; pharmaceutical preparations, official in the U. S. and British Pharmacopœias and contained in the National Formulary; chemical and therapeutic information as to mineral springs of America and Europe, and comprehensive lists of synonyms. 1110 p. 8 vo. il. 1916. $5.00

STEIN, MILTON F. Water Purification Plants and Their Operation. 258 p. 8 vo. 1920. $3.00

In this second edition, parts have been entirely rewritten, to agree with the new and somewhat different viewpoint as to the interpretation of bacteriological tests of water.

Contents: Water and its impurities. Types of purification plants. Physical and chemical tests Bacteriological testing of water. Interpretation of tests. Coagulation and sterilization. Water softening. Filtration and general operation. Appendices. Index.

STEVENS, H. P. Paper Mill Chemist. Second edition. 325 p. 12 mo. il. 1919. $4.00

Contents English and metrical systems of weights and measures. Methods of chemical analysis. Weighing. Drying. Evaporation. Precipitation and filtration Notes and calculations. Use of hydrometers. Fuels. Methods of sampling Darling's calorimeter Water analysis. Softening and purification Automatic filters. Raw materials and detection of adulterants Properties and analysis of lime, soda, caustic alkali, mineral acids, bleach, antichlors, alum, rosin and rosin size, glue, gelatine, casein, starch Mineral loading. Coloring matters. Ammonia solution Copper sulphate. Tannic acid Coal tar dyes. Fibrous raw materials half stuffs and their treatment. Cellulose and the isolation of paper making fibres. Examination and properties of rags and rag figures. Rag boiling. Pulp woods. Mechanical, sulphite, and sulphate pulps. Straw and esparto pulp Soda recovery Bleaching fibres Paper analysis and paper testing Microscopic examination and identification of fibres. Determination of percentage composition of furnish paper testing Blotting papers. Chemical analysis of paper Chemical impurities in paper Sizes and weights of papers. Conversion of ream weight to metric units and vice versa. Paper trade customs.'

STEVENS, H. P., and BEADLE, CLAYTON. Rubber Production and Utilization of the Raw Product. (Pitman's Common Commodities and Industries) 138 p. il. 12 mo. 1920 $1.00

Contents Part I The Raw Material Introductory, The Para rubber tree and rubber latex, Other rubber yielding trees Part II—Manufacturing Processes Preliminary treatment, Compounding and mixing, Ingredients and mixing, The vulcanization process, Mechanicals, Rubber solution and its application, Cut sheet, Cold curing of India rubber, Miscellaneous rubber goods; Vulcanite, Direct utilization of rubber latex, Trade customs and the present position of plantation rubber

STEVENSON, J. L. Blast Furnace Calculations. 160 p. 12 mo. il 1906 $2.50

Contents Analyses of coke, and ores, Size of furnace required; To find working capacity, Burden capacity, Calculations of cubical contents of 18' x 80' furnace, Volume by method of conical frustra; Burden capacity per ton of iron, Commencing the designing; Furnace bosh, Furnace height; Hearth, Slag tuyère, Tuyeres, Stove power and heating surface, Air capacity required; Changes in temperature, Summary of power required for any output per furnace per day; Section of 200 tons furnace, Pig iron, Analyses for comparison; Pig iron for castings, Ores suitable for Bessemer process, Purple ores; Swedish ores, Manganese and iron; Sundry analyses; Forms for recording results of operations.

STEWART, ALFRED W. Recent Advances in Organic Chemistry. With an introduction by J. Norman Collie. Fourth edition. 370 p. 8 vo. 1920. $7.50

Contents: Introduction, Organic chemistry in the twentieth century, The monocyclic terpenes, The dicyclic terpenes, The olefinic terpenes, Rubber, The alkaloids, The polypeptides, The chlorophyll problem The anthocyanins, Some theories of the natural syntheses of vital products, Trivalent carbon, Other elements which exhibit abnormal valency, Modern formulas and their failings, Some unsolved problems.

STEWART, ALFRED W. Recent Advances in Physical and Inorganic Chemistry; with an introduction by Sir William Ramsay. 284 p. 8 vo. il. 1919. $6.50

Contents The electric furnace Fixation of nitrogen Permutites Peroxides and per acids. Active nitrogen Absorption spectra X rays and some atomic properties X rays and crystal structure X ray spectra and atomic numbers Elements of rare earths Incandescent gas mantles Pseudo acids. Inactive gases Positive ray analysis Radio activity. Isotopes and Soddy's law. The elements Index

STEWART, R. WALLACE. An Elementary Textbook of Physics. In four volumes. 12 mo. Sold separately

Part I—General physics

Contents: Introductory Scalar and vector quantities Measurement of length, area and volume Measurement of time Measurement of mass Velocity Acceleration Circular motion and simple harmonic motion Force. Work and energy Composition and resolution of forces Centre of gravity Equilibrium of forces Friction. The balance. General properties of matter Properties of solids Hydrostatics. Experimental determination of specific gravity and density. Properties of liquids. Properties of gases. Index.

414 p. 12 mo. 1910 $2.00

Part II.—Sound An exposition of the fundamental facts and principles of sound. The experiments described in the text are intended to illustrate and develop the theory, but in most cases the descriptions are given with sufficient experimental detail to be of service in the laboratory

Contents: Simple harmonic vibrations. Production of sound Wave motion. Propagation of sound. Characteristics of sound. Reflection and refraction of sound. Velocity of sound in air and water Transverse vibration of strings. Longitudinal vibrations of rods and columns of air. Index.

141 p. 12 mo. 1909. $1.2

Part III—Light. In accordance with the plan of the text-book the treatment is of a strictly elementary character, and deals only with the fundamental groundwork of light. The experiments are of a very simple character, and can, in most cases, be carried out with comparatively simple apparatus. 142 carefully prepared diagrams illustrate the text.

Contents: Introductory. Rectilinear propagation of light. Photometry. Reflection at plane surfaces Reflection at spherical surfaces. Refraction. Refraction through lenses. Dispersion. Index.

219 p. 12 mo. 1909. $1.5

Part IV—Heat.

Contents: Introductory. Thermometry. Expansion of solids Expansion of liquids. Expansion of gases. Calorimetry. Specific heat

Liquefaction and solidification. Vaporization and condensation. Conduction of heat. Convection. Mechanical equivalent of heat. Radiation. Index.
246 p. 12 mo. 1910. **$1.50**

STILLMAN, THOMAS BLISS. Engineering Chemistry.
760 p. 8 vo. 1916 **$6.00**

Fifth edition of this well known guide to the testing and examination of engineering materials Although the author died in August, 1915, at a time when a complete revision was well under way, the work was continued by his two sons in a thorough and satisfactory manner For a statement of the many changes made see the *Engineering News* for February 15, 1917 A notable feature of the work is a number of late U S Navy specifications

Also reviewed in *Ice and Refrigeration*, March, 1917.

STILLMAN, T. B. Examination of Lubricating Oils. 125 p. 8 vo. 1918 **$1.75**

Contents Specific gravity; Cold test, Viscosity, Iodine absorption, Flash and fire test, Acidity, Maumene's test, Color reactions of oils with nitric and sulphuric acids, Separations of mineral oil from a vegetable or animal oil, Gumming test, Sulphur test, Test for water, Gasoline test, Microscopical examination, Carbon residue test, Fixed carbon in oil, Estimation of paraffin in mineral oils, Soap test, Determination of tarry matters in petroleum products, Greases, Coefficient of friction, Specifications for various lubricating oils, Graphite as a lubricant, Remarks on lubricating oils, The calorific power of petroleum oils and the relation of density to calorific power, Fuel oil specifications, The analysis of lubricating oils containing blown rape seed and blown cottonseed oils, The analysis of cylinder deposits, Technical examination of petroleum, Table of approximate composition of the crude oils of the United States; Table of products obtained from Pennsylvania crude petroleum when distilled destructively, Table for comparison of centigrade and Fahrenheit degrees, Wholesale prices current, Apparatus for the examination and study of the behavior of valve and cylinder oils and other petroleum and lubricating oils in saturated and superheated steam, carbon dioxide, air and other gases, References.

STOCKING, W. A. Manual of Milk Products. 578 p 12 mo. 1917. **$2.00**

STOCKS, HERBERT B. Water Analysis for Sanitary and Technical Purposes. 144 p. 12 mo il. 1912. **$2.00**

Contents: Introduction Part I.—Physical Examination. Part II.—Quantitative analysis for sanitary purposes Quantitative analysis of the mineral constituents Deleterious metals. Gases contained in solution Appendix I Standards of purity recommended by the rivers pollution commissioners. Appendix 2—Tabular view of the standards for effluents adopted by various authorities Appendix 3—Average composition of unpolluted water. Appendix 4 Tension of aqueous vapour. Appendix 5 Reduction of cubic centimetres of nitrogen to grams. Appendix 6—Loss of nitrogen by evaporating of NH_4HSO_4. Appendix 7 Loss of nitrogen by evaporation of $NH_4H_2PO_4$. Appendix 8.—Warington's method of estimating nitrates. Table of converting c c. of indigo solution to pts of N. per 100,000 Appendix 9—Table of hardness Appendix 10—Preparation of reagents required for water analysis. Index

STODDART, C. W. Chemistry of Agriculture. 364 p. 8 vo. 1915. **$2.00**

STOEK, H. H. The Storage of Bituminous Coal. 192 p 8 vo. 1918. **$0.40**

STORER, F. H. Agriculture in Some of Its Relations to Chemistry. Seventh edition, revised. 3 vols. 8 vo. 1917. **$12.00**

STOUGHTON, BRADLEY. Metallurgy of Iron and Steel. 537 p 8 vo. 1911. **$4.00**

Contents: Iron and carbon Manufacture of pig iron Purification of pig iron in general Manufacture of wrought iron and crucible steel. Bessemer process Open hearth or Siemens Martin process Defects in ingots and other castings Mechanical treatment of steel. Iron and steel founding. Solution theory Constitution of steel Constitution of cast iron Malleable cast iron Heat treatment of steel Alloy steels. Corrosion of iron and steel. Electrometallurgy of iron and steel. Metallography of iron and steel Metallurgical fuels and refractories. Chemistry and Physics. Introductory to metallurgy.

STROHM, R. T. Oil Fuel for Steam Boilers. 145 p. 12 mo il. 1914. **$1.50**

A clear, simple statement of principles that underlie the burning of oil in the furnaces of stationary steam boilers

Contents I—Properties of oil fuel. II—Requirements for efficient burning of oil fuel III.—Methods of spraying oil fuel IV.—Burners for oil fuel V—Cleaning of oil fuel VI—Pumping and heating of oil fuel VII Oil burning furnaces VIII—Installation of oil burners IX Storage of oil fuel X—Combustion of oil fuel. XI—Management of oil burning plants XII Purchase of oil fuel. XIII—Advantages and disadvantages of oil fuel XIV—Performances of oil burning boilers.

SULLIVAN, T. J. Sulphuric Acid Handbook. By Thomas J. Sullivan of the Mineral Point Zinc Co. (a subsidiary of the New Jersey Zinc Company). 239 p., pocket size, flexible binding. 1918 **$2.50**

The first handbook of the numerical data—tables, formulas and calculations—needed by chemists interested in the manufacture and use of sulphuric acid The material is based on the best modern American practice It presents in compact, accessible form the data most frequently required in sulphuric acid calculations.

Contents: Sulphuric acid nomenclature Sulphuric acid formulas and calculations Formation of solutions of sulphuric acid of definite strength Mixed acid formation calculations. Standard nitric, hydrochloric and sulphuric acid tables. Fuming sulphuric acid tables Miscellaneous sulphuric acid tables Yield of sulphuric acid from sulphur. Analysis of burner gas. Conversion of sulphur dioxide to sulphur trioxide. Analysis of sulphuric acid Analysis of mixed acid. Calibration of tanks. Mathematical tables Standard lead, cast iron and steel pipe Standard flanged and screwed fittings. Standard sheet lead. Standard brick shapes. Baumé and Twaddle formulas and scales.

SUMMERS, A. LEONARD. Asbestos and the Asbestos Industry. (Pitman's Common Commodities and Industries.) 107 p. il. 1919. **$1.00**

Contents: Asbestos; Crude asbestos; Miscellaneous uses for asbestos; Composite fireproof materials.

SUPINO, GIORGIO. Land and Marine Diesel Engines. 389 p. 8 vo. 1915. **$5.00**

SUPLEE, HENRY HARRISON. The Mechanical Engineer's Reference Book. Fourth enlarged edition. 964 p. 12 mo. il. 1913. **$5.00**

A handbook of tables, formulas, and methods for engineers, students, and draftsmen

Contents: Mathematics—Factor tables. Powers and roots. Interest. Weights and measures. Monetary systems, etc. Mechanics—statics. Funicular polygons. Centre of gravity. Statics of framed structures Wind stresses, etc Materials of engineering—Specific gravity. Weight of iron. Weight of sheet metal Weight of spheres Weight of cast iron pipe, etc. Machine design—Riveting. Bolts, Keyed fastenings. Journals, etc. Heat—Thermometers Coefficients of expansion. Fusing points Expansion of gases, etc. Air-compression and expansion of air Air transmission Compressed air. Flow of air, etc Water—Tables and properties of water. Water heads and pressures. Water heads and velocities. Flow of water through pipes, etc Fuel Calorific values of fuels Heating values of coals Liquid fuels. Gas fuels. Steam—Steam tables. Flow of steam Moisture in steam. Steam boilers. Factors of evaporation Boiler trials. Chimneys Chimney flues etc. Steam engines—Hyperbolic logarithms Expansion of steam. Economical point of cut off Multiple expansion engines Indicator diagrams. Engine performance, etc. Internal-combustion motors—Gas engines. Gas engine testing Electric power—Electric cables Wire tables National electric code. Wiring formulas. Standardization, etc. The cost of power—Water power plant costs Water power costs. Summary of boiler tests. Summary of engine tests. Steam plant costs, etc. Index.

SUTERMEISTER, E. Chemistry of Pulp and Paper Making. 479 p. 8 vo. 55 figures and 31 full page photomicrographs **$6.00**

Gives sufficient details of manufacture to afford chemists a satisfactory understanding of the chemistry involved The book is so written that any one connected with the pulp and paper industry will find it helpful and suggestive Based on personal notes and experience of twenty years, as well as a review of literature

Contents. Cellulose; Fibrous raw materials, Rags, esparto, straw, bamboo, The soda process; The sulphate process, The sulphite process, Ground wood or mechanical pulp, Bleaching, Sizing; Loading and filling materials, Coloring, Coated papers, Water, Testing wood pulps, Paper testing, Printing.

SVENSEN, CARL L. A Handbook on Piping. 359 p. 8 vo. il. 1918. **$4.00**

Brings together in convenient form, and with a wealth of illustrations, a large amount of information concerning piping, fittings, pipe joints, valves, piping drawings, and pipe lines and their accessories Tabular data have been arranged in a uniform manner and the names of the different companies given, thus obviating searches through trade catalogues. Covers steam, exhaust, condenser, feed water heater, heating, water, compressed air, gas and oil piping Has chapters on erection, insulation, and specifications, an excellent bibliography, and an appendix showing plants and elevations of installations Author is a professor in the Ohio State University

TABLES ANNUELLES DE CONSTANTS et donnees numérique de chimie, de physique et de technologie. Années 1910, 1911, 1912 3 vols. 8 vo. 1910-12 **each $7.20**

TAGGART, WILLIAM S. Cotton Spinning. Fourth edition. 3 vols. 12 mo. 1917. **$9.25**

TAILFER, L. Practical Treatise on the Bleaching of Linen and Cotton Yarn and Fabrics. Translated from the French by John G. McIntosh. 318 p 8 vo il. 1901. **$7.00**

Contents: General considerations of bleaching, steeping, washing, lye boiling, Mather and Platt's Keir, Soap; Bleaching on grass or on the bleaching green or lawn; Sours; Drying, Damages to fabrics in bleaching; Valuation of caustic and carbonated alkali, Chlorometry or filtration of decolorizing chlorides; Chlorine and decolorizing chlorides; Water, Bleaching of yarn, Installation of a bleaching works; Energy of decolorizing chlorides; Production of chlorine and hypochlorites by electrolysis. Bleaching by ozone.

TALBOT, FREDERICK A. Oil Conquest of the World. 320 p. 8 vo. 1914. **$1.75**

TANNER, A. E. Tobacco: From Grower to Smoker. (Pitman's Common Commodities and Industries.) 118 p. il. 1920. **$1.00**

Contents Historical sketch, Cultivation; Chemical changes in curing, In bond, British cigars, Cut tobacco, Roll, cake, twist, etc; Virginian cigarettes, Turkish cigarettes, Cavendish and negrohead; Snuff, The tale of figures, Offals, Smuggling, Tariff and license duties.

TANNER, FRED W. Bacteriology and Mycology of Foods. 592 p. 12 mo. il 1918. **$6.00**

A book for those who wish to fit themselves for food control, food chemists, and for students in household science who possess a sufficient fundamental training in chemistry. The methods of analysis are presented, with sufficient discussion based on the literature of the subject, to show the history and "make-up" of these methods, without which their intelligent use would be difficult. Numerous references are given at the end of each chapter, increasing the usefulness of the book to both the practitioner and the student.

TAYLOR, FREDERICK WINSLOW, and THOMPSON, S. E. A Treatise on Concrete, Plain and Reinforced; materials, construction, and design of concrete and reinforced concrete, with chapters by R. Feret, William B. Fuller, Frank P. McKibben and Spencer B. Newberry. 885 p. 8 vo. il. 1916. **$6.00**

Thoroughly revised and with 78 pages more than the second edition (1912), "Taylor and Thompson" retains its popularity as a standard practical work. Among the additions are new chapters on reinforced concrete, and a chapter on beam bridges. The chapter on building construction "has been rewritten and enlarged, giving, as illustrations, drawings of typical structures and many details showing methods of handling the design in the drafting rooms of the architect and the engineer." Chapter 3 includes the specifications for the reinforced concrete as used in the new buildings of the Massachusetts Institute of Technology.

TAYLOR, HUGH S. Industrial Hydrogen. American Chemical Society Monograph. About 200 p. 8 vo. il. 1921 **$3.50**

Contents: Introduction, Hydrogen from steam and iron, Hydrogen from water gas and steam; Hydrogen from water gas by liquefaction; Hydrogen by electrolysis; Hydrogen from water; Hydrogen from aqueous alkalis; Hydrogen from hydrocarbons, Miscellaneous and by product hydrogen processes, The purification and testing of hydrogen

TAYLOR, W. W. The Chemistry of Colloids; and some technical applications. 336 p. 12 mo. il 1915. **$2.75**

Contents: *General Properties of Colloids.* General differences between suspensoids and emulsions; Diffusion and dialysis Osmotic pressure and molar weight, Optical properties, Brownian movements, Size of particles and ultra filtration, Electrical properties, Precipitation, Properties of gels *Methods of Preparation* Crystallization methods, Solution methods; Electrical dispersion methods. *Adsorption* Surface Phenomena, Surface concentration. *Application of Colloid Chemistry* Semi-colloids; Dyeing; Tanning, The soil and purification of sewage, Applications of colloid chemistry to biology.

TERRY, H. L. India Rubber and Its Manufacture. With chapters on gutta-percha and balata 294 p. 12 mo. il. 1920. **$3.50**

Contents: Introduction; Historical and general raw rubber; Botanic origin; Tapping the trees; Coagulation, Principal raw rubbers of commerce, Pseudo rubbers, Congo rubber, General considerations; Chemical and physical properties; Vulcanization, India rubber plantations; India-rubber substitutes; Reclaimed rubber, Washing and drying of raw rubber; Compounding of rubber, Rubber solvents and their recovery, Rubber solution; Fine cut sheet and articles made therefrom; Elastic thread, Mechanical rubber goods, Sundry rubber articles, India-rubber proofed textures, Tires, India rubber boots and shoes; rubber for insulated wires, Vulcanite contracts for india rubber goods; The testing of rubber goods, Gutta percha, Balata, Bibliography.

THALLNER, OTTO. Tool-Steel. A concise handbook on tool-steel in general, its treatment in the operations of forging, annealing, hardening, tempering, etc, and the appliances therefor Authorized translation by William T Brannt. 180 p. 12 mo il. 1902. **$2.00**

THATCHER, ROSCOE W. The Chemistry of Plant Life. 286 p 8 vo 1921. **$3.00**

The first American textbook devoted to the chemistry of plant cell activities. The book aims to furnish a proper foundation upon which to build a scientific knowledge of how plants grow

Contents Introduction; Plant, Nutrients, Organic components of plants; Photosynthesis, Carbohydrates, Gums, pectins and celluloses, Glucosides, Tannins, Pigments, Organic acids, acid salts and esters, Fats and oils, waxes and lipoids, Essential oils and resins, The vegetable bases; Proteins; Enzymes, The colloidal condition, The physical chemistry of protoplasm, hormones, auximones, vitamins and toxins, Adaptations.

THOM, C., and FISK, Wa. W. The Book of Cheese. 392 p. 12 mo. il. 1916. **$1.90**

Guide in interpretation of the processes of making and handling important varieties of cheese Index. First author is investigator in cheese, formerly at Connecticut Agricultural College, second author is assistant professor of dairy industry, New York State College of Agriculture.

THOMAS, EDWARD. Chemical Patents and Allied Problems. 58 p. 1917. **$2.50**

"The present book is more than a revision of my Process Digest, since it is entirely rewritten, all the cases being reread from the point of view of an attorney and expert witness, instead of that of a Patent Office Examiner. For this reason there are specific notes on the kind of evidence needed in chemical and allied cases, and also notes covering the cases on damages, licenses etc. No attempt has been made to criticize any decision of the findings on which it is based The book is intended as a statement of the law, with a practically complete 'finding list' of the cases on which the law of chemical patents is based, and it also includes the principal cases intimately related in reasoning to such cases."—*Preface.*

THOMPSON, A. B. Old Field Development and Petroleum Mining. 648 p. 8 vo. 1917. **$15.00**

Contents: Introductory; Customs, leasing and valuation of oil-fields; Geological structure and lithological character of oil fields, and factors governing the distribution of petroleum; Indications of petroleum and phenomena associated with its occurrence; Typical oil field structures; Origin, composition, characteristics, and treatment of petroleum; Systems of drilling or boring for petroleum; Casing or lining tubes for wells and appliances employed in its insertion, manipulation, extraction, and repairs, Exclusion of water from oil wells, The extraction of petroleum and natural gas; Oil field equipment, The measurement, collection, transmission, and utilization of natural gas; Compilation of statistical records; Oil field organization and accounts.

THOMPSON, M. D. Applied Electrochemistry. 329 p 8 vo. 1911. **$2.75**

THOMPSON, W. G. The Occupational Diseases. 721 p. 8 vo. 1914. **$5.00**

THOMSON, F. A. Stamp Milling and Cyaniding. 285 p. 8 vo. il. 1915. **$5.00**

Contents: Part I.—Milling and Amalgamation. I—Gold and silver. II.—Principles of amalgamation. III.—The stamp mill and its accessories. IV.—Stamp mill amalgamation. V.—Variations in practice. VI.—Other mills and grinders. VII.—Comparisons of various mills. Part II.—Cyaniding. VIII.—History and chemistry of cyaniding. IX.—Preparation of ores for cyanide treatment. X.—Dissolving the gold and silver. XI—Separating solution and pulp XII.—Precipitation of gold and silver. XIII—Recovery and treatment of precipitate. Part III.—Treatment of Gold and of Silver Ores. XIV.—Treatment of gold ores. XV.—Treatment of silver ores.

THOMSON, J. H., and REDWOOD, BOVERTON. Handbook on Petroleum. Third edition, revised, 340 p. 8 vo. il. 1913. **$4.50**

For those engaged in the storage, transport, distribution and industrial use of petroleum and its products and calcium carbide. With suggestions on the construction and use of mineral oil lamps. Revised and added to by Major A. Cooper-Key and Sir Boverton Redwood, Bart

Contents Introductory. Sources of supply. Production, refining, marine transport. Storage and distribution. Commercial products of petroleum, shale oil, and coal tar. "Flash point" and "Fire-test" Testing. Specific gravity Boiling point Other tests. Legislation relating to petroleum (historical) Existing legislation relating to petroleum Precautions necessary for petroleum Petroleum oil lamps. Carbide of calcium and acetylene. Appendices. Index.

THOMSON, J. J. Electricity and Matter. By Joseph John Thomson, D Sc., LL.D, Ph D, F R S Fellow of Trinity College and Cavendish Professor of Experimental Physics, Cambridge University. 162 p. 12 mo. 1904. **$1.50**

"The work is an admirable example of the best kind of scientific writing in its clearness and conciseness It is possible for any one who has a slight knowledge of general physics to appreciate almost to the full the attractive ideas advanced and the cogent logic by which they are supported, while the more serious student will find many illuminating suggestions which might well have been hidden in a cloud of symbols In short, Professor Thomson's book is one which no one who takes the slightest interest in contemporary science can possibly afford to leave unread."—*The Athenæum*

THORKELSON, H. J. Air Compression and Transmission. By H. J. Thorkelson, Business Manager, formerly Professor of Steam and Gas Engineering, University of Wisconsin 207 p. 8 vo. il. 1913. **$2.50**

It gives a clear treatment of the fundamentals, and a comparison of systems, their advantages and limitations.

Contents. I Characteristics of air II Fundamental definitions III.—Characteristic and energy equations for air. IV Graphical diagrams V—Air at pressures below the atmosphere VI Air at low pressures. VII—Piston compressors VIII Efficiencies and energy compensation IX Multi stage compression X. Details of piston air compressors XI Turbo compressors XII Hydraulic compression of air XIII—Effect of altitude and compressor tests XIV—Receivers Measurement and transmission of compressed air. XV The selection and care of air compressors. Appendix A. Common logarithms. Appendix B Naperian logarithms. Appendix C. Hygrometry.

THORPE, E. A Dictionary of Applied Chemistry. By Sir Edward Thorpe, C B, LL D, F R S, assisted by eminent contributors. Sixth, new, revised and enlarged edition, to be published in six or possibly seven volumes. 8 vo. il. 1921. each, **$20.00**

Contents: Vol I A to calcium. Vol II Calculi to explosion. Vol III In preparation Vol IV In preparation. Vol. V- In preparation Vol. VI In preparation.

THORP, F. H., and Lewis, W. K. Outlines of Industrial Chemistry. By Frank H Thorp, Assistant Professor of Industrial Chemistry, and Warren K. Lewis, Professor of Chemical Engineering, in the Massachusetts Institute of Technology 665 p. 8 vo. il. 1917. **$3.75**

The great progress which has been made in Chemical Industry since the publication of the second edition of this work in 1909 has necessitated entire rewriting of many sections of the book, with elimination of much obsolete matter and the introduction of much new material While the general plan of the former editions has been retained, in treating the various subjects use has been made of the modern concepts and theories of chemistry wherever these promised to make clearer the phenomena involved The purpose is to impart to students and others not already familiar with the processes of chemical industry, some knowledge of the plant and methods employed in the more important manufacturing operations based upon chemical changes.

THORPE, EDWARD. History of Chemistry. Vol. I. From the earliest times to the middle of the nineteenth century. 210 p. 16 mo. 1909. **$1.00**

THORPE, E. Alcoholometric Tables. By Sir Edward Thorpe, C B, LL.D., F R S, late Principal of the Government Laboratory, Emeritus Professor of Chemistry, Imperial College of Science and Technology, South Kensington, London 105 p. 1915. **$1.50**

The tables are intended to facilitate the accurate estimation of the strength of aqueous solutions of ordinary alcohol and, inferentially, of spirits in general, by means of specific gravity determinations made by the specific gravity bottle, or the so called pyknometer, or by the aid of Sikes's hydrometer.

THUM, ERNEST E. A Practice Book in Elementary Metallurgy. 313 p. 8 vo. il. 1917. **$2.75**

Contents: General rules and instructions, Furnace operations, Oxidizing reactions, Reducing atmospheres and reactions, Refractories, Slags, Thermo-couple elements, Thermo couple construction The cooling curve of a pure substance, Thermo couple calibration, Lead antimony alloys, Metallography, Photo micrography, Hardness, Electric furnaces, Radiation and optical pyrometers, Transformation points, Crystallization of steel, Hardening of steel, Quenching media, Tempering and toughening, Tool making, Metallography of steels, Case carburizing, Corrosion, Molding, Composition of cast iron

Appendix A, Elementary metallurgical calculations, Appendix B, Foundry practice, Glossary of terms in common use; Appendix C, General directions for written work

TIEMANN, HARRY DONALD. Kiln Drying of Lumber. 316 p. 8 vo. 1917. Second edition. **$4.50**

TIEMANN, HUGH P. Iron and Steel. Second edition. 514 p. 16 mo. Flexible binding. 1919. **$4.00**

TILDEN, J. H. Food: its composition, preparation and effects. 306 p. 12 mo. 1918. **$3.50**

TILDEN, WILLIAM A. Chemical Discovery and Invention in the Twentieth Century. 487 p. 8 vo. il. 1919. **$5.00**

Contents: Chemical laboratories and the work done in them. Modern discoveries and theories. Modern application of chemistry. Modern progress in organic chemistry.

TINKLER, C. K., and CHALLENGER, F. Chemistry of Petroleum and Its Substitutes. 352 p. 8 vo. 1915. $5.50

TISDALE, C. W. WALKER. Butter and Cheese. (Pitman's Common Commodities and Industries.) 142 p. il. 1920. $1.00

Contents: Introductory; British dairy cattle; Milk, its production and composition. Milk analysis and distribution of constituents in butter and cheese, Bacteria. Their uses in butter and cheesemaking, Butter: Composition and properties; Purchase of milk for cream production and clotted cream; Cream ripening and the use of starters, Churning and process of buttermaking, Churning difficulties and inferior butter, Varieties of cheese; Principles of cheesemaking, Rennet Its preparation and use, The use of starters in cheesemaking; Cheesemaking apparatus; The process of cheesemaking, Cheddar, The ripening and yield of cheese; Marketing and judging

TOCH, MAXIMILIAN. The Chemistry and Technology of Paints. Second edition, revised and enlarged. 83 photomicrographic plates and other illustrations. 366 p. 8 vo. 1916 $4.50

Contents: The manufacture of mixed paints. The white pigments. The oxides of lead The red pigments. The brown pigments The yellow pigments The blue pigments The green pigments The black pigments The inert fillers and extenders Mixed paints Linseed oil Chinese wood oil. Soya bean oil Fish oil Miscellaneous oils. Turpentine Pine oil Benzine, Turpentine substitutes. Cobalt driers. Combining mediums and water Fine grinding The influence of sunlight on paints and varnishes Paint vehicles as protective agents against corrosion The electrolytic corrosion of structural steel Painters' hygiene. The growth of fungi on paint. Analysis of paint materials.

TOGNOLI, E. Reagents and Reactions. Translated from the Italian by C. Ainsworth Mitchell. 227 p. 16 mo. 1918. $2.00

Arranged according to the names of chemists, with index by subjects. Includes tests for purity of the more important reagents

TOLMAN, W. H., and KENDALL, L. B. Safety; methods for preventing occupational and other accidents and diseases 422 p. 8 vo 1913. $3.00

TORREY, J., and MANDERS, A. S. The Rubber Industry. 516 p. 4 to. 1915. $6.00

TREADWELL, F. P., and HALL, W. T. Analytical Chemistry. Translated and revised by William T. Hall, S B, Assistant Professor of Analytical Chemistry, Massachusetts Institute of Technology In two volumes Vol. I -Qualitative Analysis. Fourth English edition. 538 p. 8 vo. 1915. $4.00

A comprehensive treatise in which the fundamental principles of analysis are dealt with at considerable length Stress is laid on the theoretical side of the subject, particularly with regard to the application of the mass action law, ionisation theory, and the theory of oxidation and reduction.

Vol. II Quantitative Analysis Fourth English edition 926 p. 8 vo. 1916. $5.00

A complete manual giving methods for the gravimetric determination of the metals and metalloids in Part I. Part II considers volumetric analysis under the heads of acidimetry and alkalimetry oxidation and reduction method and precipitation analyses. Part III deals with gas analyses, while two appendices contain new matter added since the volume was first put in print

TROTMAN, S. R., Leather Trades Chemistry. A practical manual on the analysis of materials and finished products 290 p. 8 vo. il. 1918. $5.00

Contents: Analysis of fuel The estimation of nitrogen The preparation of standard solutions Water. Effluents. Depilation Deliming. Qualitative recognition of tannins. Analysis of tanning materials. Common vegetable tannins Mineral tannages. Analysis of spent liquors and tans. Oils. Soap Varnishes Skins. Analysis of leather. Fleshings and scutch Glue Benzine. Dyestuffs. Disinfectants and antiseptics. Glossary of technical terms used in the tanning industry. Index

TROTMAN, S. R., and THORP, E. L. The Principles of Bleaching and Finishing of Cotton. 347 p. 8 vo. il. 1911. $6.00

Contents: Introduction Structure of cotton fibre. The constituents of cotton. Cotton testing The carbohydrates. Water Bacteria in bleaching Cotton piece goods, introductory Steeping Transmission, impregnation and plaiting of cloth. Alkali boiling. General considerations Materials used in lye boiling. Soap Soap making Organic solvents. Kiers Washing machines. Bleaching and bleaching powder Chemicing and scouring apparatus Sodium hypochlorite and electrolytic bleaching solutions. Other bleaching agents Souring or treatment with acids. Processes. Colored goods Stains and discolorations Finishing and the materials used in finishing Mangling, drying, conditioning Stiffening. Auxiliary machines and processes Stenters. Beetling Calendering Combined finishing processes

TOWER, OLIN FREEMAN. The Conductivity of Liquids: Methods, Results, Chemical Applications and Theoretical Considerations. 82 p. 8 vo. il. 1905. $1.50

Contents. Units, Methods for determining conductivity, Apparatus used in determining conductivity, Sources of error with alternating currents; Calibration of bridge wire, Determination of resistance capacity, Water; Preparation of solutions; Dissociation of electrolytes; Dissociation constants. The migration of the ions; Determinations of Λ^{∞}; Absolute velocity of the ions, Graphic representation of conductivity; Influence of temperature and pressure, Solutions containing two electrolytes; Applications of conductivity measurements; Conductivity of single substances; Non-aqueous solutions; Conductivity of electrolytes in mixed solvents; Appendix, conductivity tables, etc.

TUCKER, J. H. A Manual of Sugar Analysis. Including the applications in general of analytical methods to the sugar industry. Seventh edition. 353 p. 8 vo. il. 1912. $3.50

Contents: Chemistry of sugars as a class; Cane sugar or saccharose; Dextrose, levulose and invert sugar; Lactose or milk sugar; Determination of specific gravity; Optical and chemical methods of determining of cane sugar; Determination of dextrose and invert sugar; Analysis of raw sugar, molasses and syrups, cane and cane juice, beet and beet juice, waste products, commercial glucose or starch sugar; Estimation of milk sugar; Estimation of dextrose in diabetic urine; The chemistry and analysis of animal charcoal.

TUCKER, S. A. Beverages; a Practical and Scientific Treatise on the Manufacture of Pure Carbonated Beverages. 63 p. 12 mo. 1920. $100.00

TURNER, THOMAS. The Metallurgy of Iron. Fourth edition, revised. 486 p. 8 vo. il. 1916. $6.00

This work is primarily intended for persons who are connected with the manufacture of iron and steel, and who already have some general knowledge of the subjects discussed. The history of the manufacture of iron and steel is treated more fully than is usual in metallurgical treatises. The portions dealing with foundry practice, and with the reactions of the puddling furnace, have been dealt with in detail

Contents: The early history of iron Modern history of iron. The age of steel. Chief iron ores Preparation of iron ores. The blast furnace The air used in the blast furnace Reactions of the blast furnace. The gaseous products of the blast furnace On the fuel used in the blast furnace. Slags and fluxes of iron smelting The properties of cast iron Foundry practice Wrought iron Indirect production of wrought iron. The puddling process Further treatment of wrought iron. Corrosion of iron and steel. Index.

TURNER, THOMAS. Practical Metallurgy. Third edition. 103 p. 8 vo. il. 1908. $1.25

A textbook intended as an introductory course for students, covering the laboratory work of the first two years, and supplying a general knowledge of the subject such as all students may be expected to require, whatever their future branch of work may be.

Contents: Introduction. Sampling and weighing Metals and alloys Oxidation and reduction Examination of fire-clay. Slags and fluxes. Examination of fuel Iron ores Determination of muffle temperatures. Silver and silver assay Assay of silver bullion Assay of silver ores. Gold assay. Assay of gold ores. Properties of mercury The micro structure of metals. Iron and steel. Electro metallurgy. Appendix. Index.

TUTTLE, JOHN B. The Analysis of Rubber. American Chemical Society Monograph. About 225 p. Ready about December 1, 1921.

TWYFORD, H. B. Purchasing. Its economical aspects and proper methods. 252 p. 8 vo. 1915. $4.00

Contents: *Purchasing.* Principles of Purchasing; General Considerations, Functional Position of Purchasing Considered, Ethics of Buying, The Purchasing Agent; The Purchasing Department, Organization of Department, System of Procedure, Obtaining and Tabulating Proper Records; Work Connected With Requisition and Order, Invoices and Method of Handling; Operation of Stores

TWYFORD, H. B. Storing: its economic aspects and proper methods. 200 p. 8 vo. il. 1918 $3.50

Contents: General considerations, Economic questions connected with storing, Specifications, definitions and standardizations; Location and equipment of storeroom; Appliances for use in the storeroom; Manual operations, Clerical work—Inventories, The stores department; Receiving material; Inspecting and placing material in storeroom, Deliveries from storeroom.

UEBELE, C. L. Paint Making and Color Grinding. 483 p. 8 vo. 1913. $10.00

UNDERWOOD, N., and SULLIVAN, T. V. Chemistry and Technology of Printing Inks. 139 p. 12 mo. 1915. $4.00

(Authors were chief and assistant chief, respectively, of the ink making division of the Bureau of Engraving and Printing, United States Treasury Department)

Contents Introduction. Testing of materials. Laboratory apparatus, Methods of analysis; Physical tests of pigments Manufacture and properties of ink making materials. Reds, Blues, Yellows; Greens; Oranges, Russets, Citrines, Blacks; Dilutents; Bases, Organic lakes, Oils; Typographic varnishes, reducers; Driers. The manufacture of printing inks General considerations; Explanation of terms; Printing inks, Plate inks; Typographic inks; Defects of inks and their remedies.

UPTON, GEORGE BURR. The Structure and Properties of the More Common Materials of Construction. 327 p. 8 vo. il. 1916. $3.00

Largely theoretical and based upon a laboratory course given to the juniors in Sibley College, Cornell University The first part deals with the determination of the properties of materials by means of engineering testing, no attempt having been made to give collections of data on the results of tests, although there is an attempt to teach how to interpret and criticize results. The second part deals with the nature and control of the internal structure of materials. The principles of physical chemistry are presented simply and with helpful diagrams. Certain parts of the book are stated to be new, the details of which have not before appeared in print.

"The form and presentation of the subject and its analytic treatment give the book distinct value as a text."—*Engineering & Contracting, Jan. 19, 1916, p. 73.*

VAN DER BIJL, H. J. The Thermionic Vacuum Tube and Its Applications. 391 p. 8 vo. il. 1920. $5.00

Contents: Properties of electrons; Dislodgement of electrons from atoms of vapors and gases; Ionization; Dislodgment of electrons from solid substances; Physics of the thermionic valve; Influence of gas on the discharge; Rectification of currents by the thermionic valve; The thermionic amplifier; The vacuum tube as an oscillation generator; Modulation and detection of currents with the thermionic tube; Miscellaneous applications of the thermionic tube.

VAN DOREN, DURAND HALSEY. Workmen's Compensation and Insurance. 332 p. 8 vo. 1918. $2.00

Problem considered in its social, economic and legal aspects. Index.

VAN HALL, C. J. J. Cocoa. 542 p. 8 vo. 1914. $2.50

VAN KLOOSTER, H. S. Physical Chemistry. Lecture Demonstrations. 196 p. 12 mo. 1919. $2.00

In all, 253 experiments are listed, under twelve chapters bearing the following titles: General properties of matter in the liquid and solid state. Diffusion. Osmosis. Vapor pressure and determination of molecular weights. Chemical equilibrium and the law of mass action. Catalysis. Electrochemistry and ionic theory. Solubility and its changes. Colloids and absorption. Actinochemistry. Flame, combustion and explosion. Liquid air experiments. A bibliography, author index and subject index are included.

VAN SLYKE, L. L., and PUBLOW, C. A. Science and Practice of Cheese Making. 499 p. 12 mo. il. 1909. $1.75

VAN WAGENEN, THEODORE F. International Mining Law. 342 p. 8 vo. 1918. $3.50

Digests the mining laws of the various countries, giving statistics of production and history of the industry in each principal field, treating also of ancient and repealed legislation and customs, as well as of the beginnings, rise, and growth of the occupation of mining. Does not include the mining of coal, iron, and non metallic substances.

VEGA. Logarithmic Tables of Numbers and Trigonometrical Functions. Translated from the Fortieth, or Dr. Bremiker's thoroughly revised and enlarged edition, by W. L. F. Fischer. Eighty-first edition. 603 p. 8 vo. $2.50

CONTENTS: Briggs or Common Logarithms of the Natural Numbers from 1 to 100,000; Logarithms of the Sines and Tangents from Second to Second, Logarithms of the Trigonometrical Functions from Ten to Ten Seconds; Table for the Conversion of Sidereal Time into Mean Time and Mean Time into Sidereal Time; Tables of Refraction; Constants.

VENABLE, F. P. The Development of the Periodic Law. 321 p. il. 12 mo. 1896. $2.50

CONTENTS: Prout's hypothesis and the Doebereiner triads, Dumas and the period from 1850 to 1860, The immediate forerunners of the periodic law, The announcement of the periodic law (1869-1871); Development of the systems (1870-1880), The development of the natural law (1880-1885), The development of the natural law (1885-1890; The development of the natural law (1890-1896).

VENABLE, F. P. The Study of the Atom or the Foundation of Chemistry. 290 p. 12 mo. 1904 $2.25

CONTENTS: Ancient views as to the nature of matter, From the Greek philosophers to Dalton, The atomic theory of chemistry, The relative weights of the atoms, The periodic or natural systems, Affinity, the atomic binding force; Valence; Molecules and the constitutions of matter.

VENABLE, F. P. Zirconium and Its Compounds. American Chemical Society Monograph. About 300 p. Ready about December 15, 1921.

VILLAVECCHIA, VITTORIO. Treatise on Applied Analytical Chemistry. Methods and standards for the chemical Analysis of the principal industrial and food products, translated by Thomas H. Pope. Vol. 1. 475 p. 8 vo. il. 1918. $6.00

"As a whole the work is extremely valuable for its full compilation of specific tests and criteria, standards and requirements for commercial purity of industrial chemical substances." *Metallurgical & chemical engineering, May 1, 1918.*

VINCENT, C. Ammonia and Its Compounds: Their Manufacture and Uses. Translated by M. J. Salter. 122 p. 8 vo. il. 1901. $2.50

CONTENTS: Extraction of ammoniacal products from sewage, Extraction of ammonia from gas liquor, Manufacture of ammoniacal compounds from bones, nitrogenous waste, beetroot wash and peat, Manufacture of caustic ammonia and ammonium chloride, phosphate and carbonate; Recovery of ammonia from ammonia; Soda mother liquor

VOORHEES, E. BURNETT. Fertilizers; source, character and composition. 365 p. 12 mo. 1916. $1.50

VOSMAER, A. Ozone, Its Manufacture, Properties and Uses. 210 p. 8 vo. il. 1916. $2.50

CONTENTS: Nature of ozone. Early history, Constitution, Nature, Occurrence; Properties, Tests. Manufacture of ozone. Non electrical methods; Electrical methods. Electrolysis Electrical discharges In general; The brush discharge in detail, Influence of medium; Influence of electrodes; Influence of current, Influence of circuit, Influence of radiations, magnetic, and electric fields, Influence of dielectric, Theory; Ozonators; Non dielectric system; Dilectric system; Efficiency Uses of ozone. Purification of drinking water, Purification of air; Therapeutic uses; Uses in the industries, List of American patents bearing on ozone; Bibliography.

The aim has been to produce a book thoroughly scientific and accurate as distinguished from the mass of literature pertaining to ozone that is purely commercial and intended for advertising uses This subject, which involves so many of the sciences, is still practically in its infancy, and its possibilities may yet prove limitless.

VULTE, HERMANN T. Household Chemistry for the Use of Students in Household Arts. Third edition, revised. 243 p. 12 mo. 1919. $1.50

CONTENTS: Introductory; Atmosphere and ventilation; Water; Metals; Glass, pottery and porcelain; Fuels; Carbohydrates; Fruits and fruit juices; Fats; Proteins; Baking Powders; Tea, coffee, chocolate and cocoa; Ferments and preservatives; Disinfectants and disinfection; Cleansing agents; Volumetric and gravimetric analysis; Reagents; Appendix.

VULTE, H. T., and VANDERBILT, S. B. Food Industries. An elementary text-book on the production and manufacture of staple foods. By Hermann T. Vulte, Ph.D., F.C.S., Assistant Professor of Household Arts, Teachers College, Columbia University, and Sadie B. Vanderbilt, B.S., Instructor in Household Arts, Teachers College, Columbia University. Third edition. 325 p. 8 vo. il. 1920. $3.00

CONTENTS: Introduction. Chapter I.—Food principles. Chapter II.—Water. Chapter III.—Cereals. Chapter IV.—The king of cereals. Old milling processes. Chapter V.—Modern milling and mill products. Chapter VI.—Breakfast foods and coffee substitutes. Chapter VII.—Utilization of flour, breadmaking. Chapter VIII.—Leavening agents. Chapter IX.—Starch and allied industries. Chapter X.—The sugar industry. Chapter XI.—Fruits, vegetables and nuts. Chapter XII.—Alcoholic beverages. Chapter XIII.—Alcoholic beverages (continued). Chapter XIV.—Fats. Chapter XV. Animal foods. Chapter XVI.—The packing house. Chapter XVII. Milk. Chapter XVIII.—Milk products. Chapter XIX. Preservation of foods. Chapter XX.—The canning industry. Chapter XXI.—Tea, coffee and cocoa. Chapter XXII.—Spices and condiments. Bibliography. Index.

WADE, A. S. Cotton Spinning. (Pitman's Common Commodities and Industries.) 102 p. il. 12 mo. 1921. $1.00

CONTENTS: The world's spindles; Cotton spinning after the war; Cotton spinning mill finance; Collective bargaining, The raw cotton position; Early spinning inventions, The jenny and the water frame; The mule and the ring frame; The modern spinning mill.

WAGNER, E. Recipes for the Preserving of Fruits, Vegetables and Meat. Translated from the German. 125 p. 8 vo. il. 1908. $2.50

CONTENTS: *Preserved Fruits* Canned Fruits; Glazed and Candied Fruits, Marmalades, Jams, and Fruit Juices; Fruit Jellies; Fruit Pulp for Ices; Preserved Vegetables; Preserved Meats.

WAGNER, FREDERICK H. Cleaning of Blast Furnace Gases. 168 p. 8 vo. il. 1914. $2.50

CONTENTS: I Theory of condensation, or cooling. II—Primary cleaning, dry dust cleaning. III. Wet cleaning, or cooling. IV.—Final cleaning. V.—Dry system for final cleaning VI.—Operative plants in America. VII.—The storage of gas.

WAGNER, F. H. Coal and Coke. By Frederick H. Wagner, Member American Gas Institute; Franklin Institute. 431 p. 8 vo. il. 1916. $5.00

A complete treatise, prepared to give the student of coal gas production data in concise form covering the various systems of coal carbonization Part I on coal covers the origin, classification, combustion, distillation, analysis, preparation and storage. Part II covers the process of coke making, the by products derived, and full descriptions of the types of coke ovens and retorts.

CONTENTS I—Origin and classification of coal. II.—Oxidation and spontaneous combustion III Coking and gas coals. IV.—Analyzing coal. V—Preparation and storage of coal. VI—Carbonization in retort benches. VII.—Combustion and the heating of settings. VIII—Flue gases. IX.—Pyrometry. X—Fuchenes thermic reactions. XI Carbonization in ovens XII—Chamber ovens. XIII.—Low temperature carbonization XIV.—Power production with waste heat. XV.—Coke.

WAGNER, F. H. Coal Gas Residuals. By Frederick H. Wagner, Mem. American Gas Institute; Franklin Institute. Second edition. 214 p. 8 vo. il. 1918. $2.50

A complete treatise giving the modern methods of securing the residuals pertaining to the carbonization of coal. It contains a full discussion of the Feld theory and practice. It has valuable data and diagrams for gas companies and chemical manufacturers. The second edition includes much new material and a new chapter on the manufacture of sulphuric acid when spent oxide is used as a base.

CONTENTS: I.—Tar. II—Naphthalene. III—Cyanogen. IV.—Ammonia. V.—Benzol. VI—Sulphuric acid. VII.—Tests

WAGNER, JOSEPH B. Seasoning of Wood. A treatise on the natural and artificial processes employed in the preparation of lumber for manufacture with detailed explanations of its uses, characteristics and properties. 275 p. 8 vo. il. 1917. $4.00

CONTENTS: Timber; Coniferous Trees; Broad-leaved Trees; Grain, Color, Odor, Weight and Figures in Wood; Enemies of Wood, Water in Wood; What Seasoning Is, Advantages of Seasoning; Difficulties of Drying Wood, How Wood is Seasoned, Kiln Drying of Wood; Types of Dry Kilns, Dry Kiln Specialties; Helpful Appliances in Kiln Drying

Until quite recently very little attention has been paid to the proper seasoning of wood, other than that by keeping lumber exposed for a period of time after sawing it was then ready (seasoned) for use. Recently, however, wood users have become much interested in the operations of kiln drying and its advantages, so that the need for a practical treatise on technical features of this process is keenly felt. Mr. Wagner's book contains the results of many years of practical working with lumber, and is based on a close study of the different species of wood under varying mechanical temperatures and under different drying processes.

WAHL, A. The Manufacture of Organic Dyestuffs. Authorized translation with additions from the French of André Wahl, D. ès Sc., Professor of Industrial Chemistry in the University of Nancy, by F. W. Atack, M.Sc.Tech., B.Sc., A.I.C., Demonstrator in the Chemical Laboratories of the School of Technology, University of Manchester. 338 p. 12 mo. 1914. $2.00

WALLIS-TAYLER, A. J. The Preservation of Wood; a descriptive treatise on the processes and on the mechanical appliances used for the preservation of wood. 344 p. 8 vo. il. 1917. $4.00

Brings together a large amount of practical, well illustrated information on wood decay, seasoning, details of various preserving methods, absorption limit and life of preserved wood, fireproofing, and costs, with an appendix containing useful formulæ, tables, memoranda, etc.

WALLIS-TAYLER, A. J. Sugar Machinery. A descriptive treatise devoted to the machinery and apparatus used in the manufacture of cane and beet sugar. Second edition, revised and enlarged. 390 p. 12 mo. il. 1912. $3.00

CONTENTS: Complete factories; Extraction of the juice from the raw material, Raising or pumping and weighing the juice or liquor; Heating and clarification or defecation of the juice or liquor, Mechanical purification of the liquor; Evaporation, concentration, and granulation under atmospheric pressure and in vacuo; Evaporation and concentration in vacuo; Curing or extracting the molasses from the sugar; Extraction of the waste sugar from the molasses; Formation of crystals from sugar solutions; Treatment of saccharine liquids by electricity; Tests; Transport of canes; Repairs and renewals; Specimen forms for use in sugar factories; Useful tables, memoranda, etc.; Technology of sucrose.

WALSH, JOSEPH J. Physics and Chemistry of Mining and Mine Ventilation. A practical handbook for vocational schools, and for those qualifying for mine foreman and mine inspector certificates. By Joseph J. Walsh, Mine Inspector, Wilkes Barre, Pa. Second edition, revised and enlarged 229 p. 8 vo. il. 1918. $2.50

All the general features contained in the first edition which students and others interested in the physics and chemistry of mining and mine ventilation commended have been retained in this revised edition. The chapters dealing with gases and mine ventilation have undergone revision and new material added The chapter treating of the new sampling and analysis of mine gases is new, and has been written to supply a need which has arisen in teaching gas analysis, and also to meet the growing demand for a more thorough knowledge of this branch of mining In this chapter mine gases are treated in a more practical way than is the custom in ordinary books on the subject The properties of gases and the changes which affect their composition, together with the products of the combustion of gases, are clearly defined.

WALTER, ERICH. Manual for the Essence Industry. 427 p 8 vo. 1916. $4.00

Contents: Flavoring and its transfer to foods and beverages Raw materials yielding the different tastes. Laboratory practice Non alcoholic beverages Mineral waters, fruit juices and essences for effervescent lemonades, jams and fruit wines Essences for confectionery. Baking and the kitchen. Coloring matters for foods and drinks Cosmetic essences (perfumery, cosmetics and soap perfumes).

WANG, CHANG YU. Antimony. 217 p 8 vo. il 1909. $5.00

Contents: The history of antimony The chemistry of antimony The mineralogy of antimony The geological occurrence of antimony ores. The metallurgy of antimony. The antimony preparations and their uses The analysis of antimony compounds. The production and valuation of antimony ore The principal mines and smelting works of antimony Index.

WANG, CHANG YU Bibliography of the Mineral Wealth and Geology of China. 63 p 12 mo. 1917. $1.25

Contents: Minerals (including mining and metallurgy), coal, iron, gold and silver; Minerals in general, Mining industry in general Geology. General petrology, palæontology.

WANKLYN, J. A. Water Analysis. A practical treatise on the examination of potable water. Eleventh edition. Revised by W. J. Cooper. 240 p. 12 mo. il. 1907. $2.00

WANKLYN, J. ALFRED, and COOPER, WILLIAM JOHN. Sewage Analysis. A practical treatise on the examination of sewage and effluents from sewage. Including also a chapter on utilization and purification. 220 p. 12 mo. il. 1899 $2.00

Contents: Introduction The specific gravity of sewage and sewage effluents. Chlorine. Sulphates in sewage and sewage effluents. The carbonic acid in sewage and sewage effluents. The ammonia method of sewage analysis - Free and albuminoid ammonia The moist combustion process applied to sewage and sewage effluents The total solid residue, its amount and examination General statement of analytical results. The utilization and purification of sewage

Appendix - Chemistry of manganese On the action of permanganate of potash on urea, ammonia, and acetamide in strongly alkaline solution. Water analysis: Determination of cellulose and modified cellulose in drinking water Action of alkaline solutions of permanganate of potash on certain gases. The moist combustion processes Some reactions of alkaline permanganate of potash. Products of the oxidation of wool cyano propionic acid. Notes on hydrogen gas Nature of solutions as to density of specific gravity On magnesium On a proposed method of preventing the fermentation in sewage and the formation of sewer gases. Social science congress, health department On the comparative effect of lime and other chemicals upon sewage Index.

WARE, L. S. Beet-Sugar Manufacture and Refining. By Lewis S. Ware, Editor "The Sugar Beet" Vol. I. Permanently out of print.

Vol. II. Evaporation, Graining, and Factory Control. 647 p. 8 vo. il. 1905. $5.00

Contents: Part IV—Evaporation. Evaporators Multiple effects. Condensation Multiple reheating. Perturbations. Calculations. Part V Manufacture of raw sugar Graining Preparing massecuite. Curing Transportation and storage Part VI.—Working after products Crystallizing tanks Crystallization in motion Graining after products Epuration and return of after products into the juices Graining pans and crystallizators. Curing Part VII Manufacture of white sugar. Granulated sugar. Loaf sugar Cakes and bars. Sawing, crushing and breaking sugar. After products and refining losses. Part VIII—Utilization of residues Extraction of sugar from molasses. Elution Substitution and separation Desugarization of molasses. Part IX—Steam economy. Part X.—Practical working of a beet sugar factory.

WARNES, A. R. Coal-tar and Some of Its Products. (Pitman's Common Commodities and Industries.) 105 p. il. 1919. $1.00

Contents: Coal tar and its manufacture; Prepared tar; Tar for roofing felt, Yield of distillates from tar; Destructive distillation of coal tar; Pitch and its uses, Creosote oil and its uses; Naphthalene and its uses, Anthracene oil, Ammoniacal liquor and the manufacture of some compounds of ammonia, Working up of crude naphtha and light oil; Chemical treatment of once run benzol, Once-run naphtha and once-run heavy naphtha; Manufacture of benzols and naphthas, Manufacture of commercially pure benzene and toluene, and some of their uses, Manufacture of pyridine bases; Manufacture of carbolic and cresylic acids, and some of their uses.

WARNES, ARTHUR R. Coal-tar Distillation and Working Up of Tar Products. Second edition, revised and enlarged. 315 p. 8 vo. il. 1914. $5.00

Contents: Coal tar composition; Effect of nature of raw material and heat of carbonization on physical properties and chemical composition of tar; Results of practical distillations; Coalite tar; Vertical retort tar; Increasing toluene in tar; "Free carbon" of tar; How tar is received from gas works; Tar tips; Storage of tar; Construction of storage tanks, Pumps; Tar mains; Plants used in the distillation of tar; Distillation of coal tar, Plant for and recovery of cresylic and carbolic acids from oils; Plant for and the recovery of benzols; Naphthas, etc.; First distillation and washing; Rectification of benzols and naphthas; Plant for the working up of pyridine from pyridine-acid, Recovery and rectification of pyridine bases; Plant for, and the manufacture of, crude napthalene and anthracene; Pitch and pitch "getting", Creosote; Gas stripping; Tarworks' tests; Appendix.

In the second, revised and enlarged edition many additions have been made to the majority of the old chapters, some new diagrams have been inserted, and the subjects of continuous dehydration and distillation have received some attention. On account of its importance and its close connection with the coal tar industry, an entirely new chapter on the subject of gas stripping is given.

WASHBURN, E. W. Introduction to the Principles of Physical Chemistry; from the standpoint of modern atomistics and thermodynamics. 445 p. 8 vo. 1915. $4.00

Contents: I -The structure of matter and the composition of substances. II—The gaseous state of aggregation. III—The liquid state of aggregation. IV—Liquid gas systems. V—The crystalline state of aggregation. VI—Crystal gas systems. VII—Crystal liquid systems VIII -Relations between physical properties and chemical constitution. IX - The Brownian movement and molecular magnitudes X—Some principles relating to energy. XI.—Solutions I: Definition of terms and classification of solutions XII—Solutions II: The colligative properties of solutions and the thermodynamic relations which connect them XIII—Solutions III: Thermodynamic environment. Ideal solutions and dilute solutions. XIV.—Solutions IV: The laws of solutions of constant thermodynamic environment. XV—The colligative properties of solutions of electrolytes. XVI—The conduction of electricity. XVII—Conductance and degree of ionization XVIII Electrical transference XIX—Thermochemistry. XX—The heat capacity and internal energy of material systems XXI—Chemical kinetics. XXII—Chemical equilibrium XXIII—Chemical equilibria involving the ions of water. XXIV—The phase rule. XXV—Disperse systems. XXVI—Radioactivity. XXVII—Atomic structure and the periodic system. Appendix—Thermodynamic derivations.

WASHINGTON, HENRY S. Manual of the Chemical Analysis of Rocks. Third edition, revised and enlarged. 271 p. 8 vo il. 1919. $2.50

Contents: Introduction Apparatus and reagents. The sample. Operations. Methods Appendixes. Index.

WATSON, E. S. Color in Relation to Chemical Constitution. 197 p. 8 vo. il. 1918. $4.50

Contents Early history Discussion of the quinonoid theory. Absorption spectra Relationships between constitution and depth of color Theories on the nature of the vibrations causing absorption bands and color Infra-red absorption spectra Fluorescence. Color and spectra of inorganic compounds Bibliography Index.

WATT, A. The Art of Paper-making. A practical handbook of the manufacture of paper from rags, esparto, straw, and other fibrous materials, including the manufacture of pulp from wood fiber. Third edition. 260 p. 8 vo. il. 1908. $4.00

Contents: Cellulose; Materials used in Paper-making; Treatment of Rags; Treatment of Esparto; Treatment of Wood, Treatment of Various Fibers, Bleaching; Beating or Refining, Loading, Sizing; Coloring; Making Paper by Hand, Making Paper by Machinery, Calendering, Cutting, and Finishing, Colored Papers, Miscellaneous Papers; Machinery Used in Paper making, Recovery of Soda from Spent Liquors, Determining the Real Value or Percentage of Commercial Sodas, Chloride of Lime, etc; Useful Notes and Tables

WATT, A. Electroplating and Electro Refining of Metals. Being a new edition of Alexander Watts' "Electro-Deposition." Revised and largely rewritten by Arnold Philip. Second edition, revised. 704 p. 12 mo. 1902. $5.00

Contents: Batteries, Thermopiles, Cost of electrical installations for small output for electroplating, Electro deposition of copper, Deposition of gold by simple immersion, Electro deposition of gold and silver; Various gilding operations, Imitation antique silver; Electro deposition of nickel, tin, iron, zinc and other metals and alloys; Recovery of gold and silver waste from waste solutions, Mechanical operations involved in electro deposition, Materials used; Electroplating.

WATT, HOMER ANDREW. The Composition of Technical Papers. 431 p 12 mo. 1917. $1.75

A textbook which aims to teach engineering students to write better technical papers. It is the "result of a teaching experience of several years at the University of Wisconsin, and embodies the methods employed there in a one semester, three-hour course elective for juniors and seniors in the College of Engineering"

WATTS. Dictionary of Chemistry. Revised and entirely re-written by M. M Pattison Muir, M.A, F.R.S.E., Gonville and Caius College, Cambridge; and H. Forster Morley, M A., D.Sc., Professor of Chemistry, University College, London; assisted by eminent contributors. Complete in four volumes. 8 vo. 1911-1914. $50.00. Separately as follows:

Vol. I. (A-Ch). 772 p.	$14.50
Vol. II. (Ch-In). 772 p.	$14.50
Vol. III. (In-Ph). 868 p.	$16.00
Vol. IV. (Ph-Z). With addenda. 934 p.	$20.00

WEAVER, E. M. Notes on Military Explosives. Fourth edition. 382 p. 8 vo. 1917. $3.75

Describes the substances used in the manufacture of explosives, and the processes of manufacture of the various military explosives; exploders; tests, handling and storage of explosives. Sections on laboratory experiments and regulations for transportation of explosives are appended.

Author is Major General, U. S. Army; Chief of Coast Artillery.

WEBBER, EDUARDO. Technical Dictionary. English, French, Italian, German arranged in parallel columns. 921 p. 16 mo. 1918. $5.00

WEBBER, W. H. Y. Gas and Gas-Making. (Pitman's Common Commodities and Industries.) 130 p. il. 12 mo. 1919. $1.00

CONTENTS: The nature and origin of the gas industry; Gas supply as a public service undertaking, Early methods of gas making, Gas manufacture; The middle period; Gas manufacture, Later practice; Modern carbonizing standards, Gasworks' plant, Gas transmission and distribution; Gas distribution (continued), Gas measurement and regulation, General uses of gas, Gas as fuel, Fuel applications of gas, Gas lighting by incandescence, Cooking by gas, Water heating by gas, Gas fires, The industrial uses of gas; Speculation as to the future, Hints for gas consumers.

WEBER, CARL OTTO. The Chemistry of India Rubber. New edition. 314 p. 8 vo. il. 1910. $6.00

CONTENTS: The chemistry of India rubber. Examination and valuation of gutta percha and India rubber. Examination of India rubber substitutes. Inorganic compounding materials. Vulcanizers and sulphur carriers. India rubber solvents. Coloring matters. Constructive components of India rubber articles. Analysis of rubber articles. Appendix – Sanitary conditions in India rubber works. Index.

WEED, WALTER HARVEY. The Mines Handbook; an enlargement of the Copper Handbook founded by Horace J Stevens, 1900. v. 13. 1918. 1896 p. 8 vo. Maps $10.00

The well known Copper Handbook has now become a most excellent directory of *all* the metal mines. Prominent changes noted are the geographical arrangement of companies (with alphabetical index) and compact maps of the mining districts. Foreign mines are included, and the information regarding Japanese mines is stated to be especially noteworthy.

WEGMANN, E. Conveyance and Distribution of Water for Water-supply; aqueducts, pipe lines, and distributing systems 663 p. 8 vo. il. 1918 $5.00

Aims to treat with "sufficient detail to be of practical value" such subjects as water distribution, the detection and prevention of waste by means of Pitot tube gaugings and water meters, fire protection, high pressure water systems, tapping machines, valve inserting machines, water stage recorders and other devices and appurtenances. Leading types of apparatus are described, and chapter 10 on submerged pipes is especially noteworthy. Well illustrated and supplied with useful tables and specifications. The author served for thirty years as engineer in connection with the construction and maintenance of New York City's water supply.

WEISS, H. F. Preservation of Structural Timber. Second edition. 361 p. 8 vo. 1920. $3.50

CONTENTS: I. Introduction. II – Factors which cause the deterioration of structural timber. III – Effect of the structure of wood upon its injection with preservatives. IV – Preparation of timber for its preservative treatment. V. Processes used in protecting wood from decay. VI. Preservatives used in protecting wood from decay. VII – Construction and operation of wood preserving plants. VIII – Prolonging the life of cross ties from decay and abrasion. IX. Prolonging the life of poles and cross arms from decay and insects. X. Prolonging the life of fence posts from decay. XI. Prolonging the life of piling and boats from decay and marine borers. XII – Prolonging the life of mine timbers. XIII – Prolonging the life of paving blocks. XIV. Prolonging the life of shingles. XV. Prolonging the life of lumber and logs. XVI – Protection of timber from fire. XVII – Protection of wood from minor destructive agents. XVIII. Strength and electrolysis of treated timber. XIX – Use of substitutes for treated timber. XX – Appendices.

WELLS, HORACE L. Chemical Calculation Tables. 43 p. 8 vo. 1919. $1.35

A revision and modification of the author's "Tables for Chemical Calculations," which is now out of print. A new table for facilitating the calculation of percentage compositions of organic compounds has been added, while several of the smaller, less important, tables have been omitted, with a view to making the book more compact and more convenient for its chief use.

The table of logarithms of numbers has been "double thumb indexed," making it easy to turn from any place in the table to any other reference, backward as well as forward, all indices being visible from every part of the table.

In addition to making the work of calculation more rapid and less laborious than is often the case, these tables will be of assistance in avoiding errors.

CHAPTERS: Atomic weights. Gravimetric factors. Formula-weights. Indirect analyses. Reduction of gas volumes to 0° and 760 mm. Calculation of percentage of nitrogen from the gas volume. Barometer corrections for temperature. Multiples for organic compounds. Constants for molecular weight determinations. Weights and measures. Logarithms of numbers.

WELLS, H. L. Textbook of Chemical Arithmetic. By Professor Horace L. Wells, M.A. 169 p. 12 mo. 1912. $1.50

A book designed for students of quantitative analysis. It comprises problems in weights as related to gravimetric analyses, calculations relating to gases and calculations relating to volumetric analyses.

SUMMARY OF CONTENTS: Part I – APPROXIMATE NUMBERS. Apparent errors, accidental errors. The multiplication and division of approximate numbers, abbreviated multiplication, errors in the use of logarithms. Operations with logarithms, etc. Part II. CALCULATIONS RELATING TO WEIGHTS. Relative atomic weights, atomic weights compared with a basis. The calculation of factors. The calculation of weights from single equations. Calculation of indirect analyses in more complex cases. Calculation of formulas from analyses in cases of isomorphous replacement. Calculations by use of ratio numbers. Calculations of formulas in connection with molecular weights, etc. Part III.—CALCULATIONS RELATING TO GASES. The weights of gases under varying conditions. Densities and molecular weights of gases. The relation of weights and volumes in terms of English weights and measures. The correction of barometers for temperature, etc. Part IV – CALCULATIONS RELATING TO VOLUMETRIC ANALYSIS. Standardization of volumetric solutions. Simple factor solutions. Errors in volumetric processes, etc. Appendix.—Answers to problems. Atomic weights; International table. Atomic weights of commoner elements and some of their multiples, with logarithms. Some multiples of atomic weights and group weights, etc.

WESTCOTT, HENRY P. Handbook of Casinghead Gas. Second edition. 577 p. 12 mo. il. 1918. $3.50

WESTCOTT, HENRY P. Handbook of Natural Gas. Third edition. 750 p. 12 mo. 1920 Cloth $3.75 Leather $4.50

WESTCOTT, HENRY P. Measurement of Gas by Orifice Meter. 408 p. 8 vo. il. 1918. $3.50

CONTENTS: General, Measuring gas by orifice meter or Pitot tube; Orifices; Capacity; Encased spring type differential gauge; Installing, To check differential gauge, Coefficients; Correcting coefficients, Charts, Pressure extensions, Miscellaneous, Index.

WHEELER, H. J. Manures and Fertilizers. 389 p. 12 mo. 1913 $2.40

WHERLE, GEORGE. American Gas Works Practice. Standard, practical methods in gas fitting, distribution and works management. 741 p. il. 1919. $4.00

CONTENTS: History and progress, Gases and their properties; Manufacturing methods, Distribution suggestions, Labor saving in the gas industry, Utilization of gas, Employees, Management, The fitting shop, Connecting appliances, House piping, Consumers' meters, Meter repairs and tests, Street department mains, Services and records, Acetylene welding, Storeroom and fitting rules, Gas company rules.

WHITBY, G. STAFFORD. Plantation Rubber and the Testing of Rubber. (Monographs on Industrial Chemistry.) 559 p. 8 vo. il. 1920 $9.50

CONTENTS: Part I. The preparation of plantation rubber; The rubber tree and the extraction of latex, Latex and its coagulation, The resin, The protein, Collection of latex, Coagulation in the factory, Crepe, Sheet; Maturation, Variation. Part II. The Testing of Rubbers. The stress-strain relations of rubber, The modulus of elasticity; Technique of tensile tests, Technique of vulcanization testing, Progressive changes on vulcanization, Comparison of raw rubber samples; Stability of state of cure, Technical mixes, Viscosity determinations, Cycles of extension and retraction, Hysteresis, Elastic after-effect, Relation of the terminal optical and electrical to the mechanical behavior of rubber, Poisson's ratio, Bibliography, Index.

WHITE, ALFRED H. Technical Gas and Fuel Analysis. Second edition, revised and enlarged. 319 p. 8 vo. 59 il. 1920 $3.00

A completely revised and greatly enlarged edition of this standard reference and textbook, describing standard apparatus and presenting a concise statement of principles and full details of methods.

CONTENTS: I. Sampling and storage of gases. II. General methods of technical gas analysis. III. Absorption methods for carbon dioxide, unsaturated hydrocarbons, oxygen, carbon monoxide and hydrogen. IV. Explosion and combustion methods for hydrogen, methane, ethane and carbon monoxide. V. Various types of apparatus for technical gas analysis. VI. Exact gas analysis. VII. Heating value of gas. VIII. Candle-power of illuminating gas. IX. Estimation of suspended particles in gas. X. Chimney gas. XI. Producer gas. XII. Illuminating gas and natural gas. XIII. Liquid fuels. XIV. Sampling coal. XV. The chemical analysis of coal. XVI. Heating value of coal by the bomb calorimeter. XVII. Heating value of coal by the Parr calorimeter and other methods. Appendix. Tables.

WHITE, BENJAMIN. Gold: Its Place in the Economy of Mankind. (Pitman's Common Commodities and Industries.) 130 p. 12 mo. il. 1920. $1.00

CONTENTS: Its appreciation. Ancient and modern, Its properties and distribution, The production of early times, The production of the nineteenth century, Present production and prospects, The evolution of British coinage, The mintage of the world, The gold standard, The movements of gold, Stocks, Industrial use, Gold and the great war.

WHITE, BENJAMIN. Silver. (Pitman's Common Commodities and Industries.) 126 p. 12 mo. il. 1920. $1.00

CONTENTS: Part I. Production. Geological surroundings and world production, Early minefields, Modern minefields, Extraction from ore, Marketing. Part II. Industrial Consumption. Art in silver, Manufacture, Indiana industries, The evolution of British coinage. Part III. Utility as Money, Past and Future. Indian currency, Chinese monetary problems, The place of silver in currency, The present position and future prospect of silver as money.

WHITE, C. H. Methods in Metallurgical Analysis. By Charles H. White, Prof. of Mining and Metallurgy in Harvard University. 364 p. 12 mo. 1915 $3.00

The book is a compilation of methods which are used in American metallurgical laboratories. An excellent handbook for the commercial analyst as well as for the student.

CONTENTS: Definition of the subjects; Sampling, Necessity for correct sampling, The operations of analysis; Gravimetric, volumetric analysis, Colorimetry, Methods of analysis in the metallurgy of iron and steel, Moisture, Hygroscopic water, Combined water, Loss on ignition, Iron in ores, Silica, sulphur, phosphorus, alumina, manganese, lime, magnesia and titanium in ore, Analysis of: Iron and steel; Iron slags, Limestone, Methods of analysis in the metallurgy of copper, lead, etc., copper, lead, zinc and arsenic in ore; Analysis of. Copper matte, Chilled blast furnace slags, Reverberatory slags, Briquettes and other copper bearing products, Copper bullion, Alloys; Methods of analysis in the production of the precious metals, Fine assaying of gold and silver ores, Assay of bullion, gold and silver in cyanide solution; Testing cyanide solution, Weight of ore in sluice; The platinum metal; Analysis of fluxes, Analysis of fuels, analysis of clay; Methods for the determination of some of the minor metals, methods for the determination of some of the rarer metals, Testing of lubricating oils, Examination of boiler water, Detection of the metals, Tables; General references.

WHITMORE, FRANK C. Organic Compounds of Mercury. American Chemical Society Monograph. 395 p. 8 vo. July, 1921. $4.50

CONTENTS: Historical outline; General methods of preparing organic mercury compounds; General properties and reactions of organic mercury compounds; Alkyl mercury compounds, Mercury compounds obtained from olefines and acetylenes, Mercury compounds from saturated and unsaturated alcohols, Mercury derivatives of fatty acids and related compounds, Mercury derivatives of aldehydes, ketones, amides and related compounds; Mercury derivatives of aromatic hydrocarbons and nitro compounds; Mercury derivatives of aromatic amines, Mercury derivatives of phenols, naphthols, and related compounds; Mercury derivatives of aromatic acids; Mercury derivatives of aromatic

ketones, terpenes and related compounds; Mercury derivatives of heterocyclic compounds, Azo compounds and aromatic arsenicals; Analyses of organic mercury compounds; List of proprietary mercurials; Bibliography of biological and pharmacological work with organic mercury compounds; Supplementary bibliographical lists; Lists of patents dealing with organic mercury compounds; Index.

WHITTAKER, C. M. Application of the Coal-tar Dyestuffs: The principles involved and the methods employed. 225 p. 8 vo. 1918. $3.00

This book has been written with a view to giving the reader a firm grasp of the chemical principles involved, and the methods used in the application of the coal tar dyestuffs, so that when he commences to carry out dyeing under actual commercial conditions he will know the why and the wherefore of the methods employed

CONTENTS: General Survey of Dyeing; The Varied Uses of the Basic Dyestuffs; The Application of the Acid Dyestuffs, The Turkey-Red Industry, and Other Uses of the Alizarine Dyestuffs; The Application of the Direct Cotton Dyestuffs, Including Those Which Develop on the Fiber, The Azo-coloring Matters and Their Special Use in Dyeing; The Properties of the Resorcine Dyestuffs, The Applictaion of the Sulphur Dyestuffs; The Application of the Vat Dyestuffs, The Dyeing of Union Materials, Including Garments; Colors Produced on the Fiber by the Oxidation of Coal tar Products, Other Uses of Coal tar Dyestuffs Still in Use; The Valuation and Detection of Dyestuffs

WHITTAKER, C. M. Dyeing with Coal-tar Dyestuffs. 214 p. 8 vo. 1919. $3.00

WHYMPER, R. Cacao and Chocholate: Their chemistry and manufacture. Second edition, revised and enlarged. 568 p Large 8 vo. 1921. $10.00

CONTENTS: History, botany, and agriculture of cacao Manufacture of chocolates and cacao powders. Chemistry of cacao Bibliography. Index.

WIARD, E. S. Theory and Practice of Ore Dressing. 426 p. 8 vo. 1915. $4.00

CHAPTER HEADINGS I.—Preliminary considerations relating to installation of ore-dressing plants. II.—Testing concentrating ores. III.—Location of mills IV.—Crushing plant. V.—Separating plant. VI.—General dissertation on crushing Heavy crushing machinery VII.—Rolls and medium crushers VIII.—Means for raising ore or ore and water. IX.—Grading and grading devices according to diameter and volume. X.—Separation or concentration proper, coarse concentration. XI.—Preparation for sand and slime concentration Sand and slime concentration. XII.—Miscellaneous processes of sand and slime concentration.

WIECHMANN, FERDINAND G. Sugar Analysis. For cane-sugar and beet-sugar houses, refineries and experimental stations, and as a handbook of instruction in school of chemical technology. Third edition, rewritten. 321 p. 12 mo. 1914. $5.00

CONTENTS: Instruments used in sugar laboratories; Polariscopes and accessories; Sucrose determination of optical and chemical analysis; Sucrose determination by optical and chemical; Constituents of sugar other than sucrose; Materials used in the sugar industries; Analytical control in cane-sugar and beet-sugar manufacture; Analytical control in refineries; Résume of the work of the International Commission for uniform methods of sugar analysis.

WILEY, HARVEY W. Foods and Their Adulteration; origin, manufacture and composition of food products, infants' and invalids' foods; detection of common adulterations. Third edition, revised. 646 p. 8 vo. il. 1917. $4.00

WILEY, H. W. Principles and Practice of Agricultural Analysis. A manual for the study of soils, fertilizers, and agricultural products. For the use of analysts, teachers, and students of agricultural chemistry. Second edition, revised and enlarged 3 vols. 8 vo. 1914.

Vol. I. Soils.	$4.00
Vol. II. Fertilizers and Insecticides	$4.50
Vol. III. Agricultural Products.	$6.00

WILLAMAN, JOHN J. Vocational Chemistry. 294 p. il 8 vo. 1921. $1.75

CONTENTS: The field of chemistry, The composition of the universe; The atmosphere, Water, Combustion and fuels; Carbon; Acids; Alkalis and salts; The light metals, The heavy metals; Some common non metals; The agricultural chemical elements, The soil; Chemical changes in the soil; Manures and fertilizers; The plant body; The animal body; The nutrition of the animal body; Foods and feeds; Chemistry of the cooking and preserving of foods, Milk and its products, Chemistry of cleaning; Appendix; List of references to supplement this text; List of apparatus and chemicals required; The metric system

WILLIAMS, H. Mechanical Refrigeration. A practical introduction to the study of cold storage, ice making and other purposes. By Hal. Williams, A.M.I.M.E. 406 p. 12 mo. 1917. $4.25

WILLIAMS, H. E. Chemistry of Cyanogen Compounds; their manufacture and estimation. 423 p. 8 vo. 1915. $3.50

WILLIAMS, ROBERT S. Principles of Metallography. A brief introductory work. 158 p. 8 vo. 1920. $2.00

CONTENTS The sample alloy diagram. Laboratory methods of metallography The alloy diagram and its meaning The non ferrous alloys of technical importance. Iron and steel. Defective material.

WILLOUGHBY, EDWARD F. Milk: Its Production and Uses. With chapters an dairy farming, the diseases of cattle, and on the hygiene and control of supplies. 259 p. 12 mo. il. 1904. $2.50

CONTENTS: Breeds of dairy cows. The housing of cows. The food of the cow. Diseases of the cow. Legal aspects of disease in cattle. The elimination of tuberculosis. Inspection and control of cowsheds. The physiology of milk. Dietetics of milk and milk preparations. Therapeutics of milk. The relation between milk and disease. The dairy Milk analysis. Control of adulteration. Bacteriological examination of milk. Index.

WILLOWS, R. S., and HATSCHEK, E. Surface Tension and Surface Energy, their influence on chemical phenomena. Second edition. 80 p. 12 mo. il. 1919. $1.50

WILSON, FRANCIS H. Coal: Its Origin, Method of Working, and Preparation for the Market. (Pitman's Common Commodities and Industries.) 129 p. il. 1920. 12 mo. $1.00

CONTENTS: Formation of coal seams; Varieties of coal; The winning of coal seams, Prospecting and boring; Sinking shafts; Special methods of sinking; Working coal seams; The history of coal mining; Methods of working; Machine mining; Underground haulage, Raising the coal to the surface; Surface arrangements, Banking and screening; Coal-washing; Coke-making; Aerial ropeway; The manufacture of briquettes; The shipping of coal; Coal fields of the world; British coal fields, Colonial coal fields; Foreign coal fields; Our coal resources; Coal resources of the world; Waste of coal; The coal trade; History of the coal trade; Coal production and consumption of the world.

WILSON, F. J., and HEILBRON, I. M. Chemical Theory and Calculations. An elementary textbook. 145 p. 12 mo. il. 1913. $1.75

CONTENTS: The Metric System. Density and Specific Gravity Thermometry. The Gas Laws. Solubility of Gases in Liquids. The Atomic Theory. Formulas and Equations Calculation of Percentage Composition of a Compound from its Formula. Calculation of Empirical Formula from Percentage Composition Equivalents or Combining Weights. Atomic Weights. Valency. Periodical Classification of the Elements. Law of Mass Action. Determination of Vapor Densities Osmotic Pressure and Molecular Weight Determination. Dissociation of Gases. Electrolytic Dissociation. Diffusion of Gases. Quantitative Analysis. Thermo chemistry.

WILSON, H. MACLEAN, and CALVERT, H. T. A Textbook on Trade Waste Waters. Their nature and disposal. 340 p. 8 vo. il. 1913. $6.00

The material has been gathered during many years' experience. Trade processes are described to show the origin and nature of polluting waste liquids, and the means which have been found successful in the purification of these. The book will be of service to manufacturers and those called upon to advise them

CONTENTS: Chapter I Historical and legal. Chapter II.—The coal trade. Chapter III.—Coal gas manufacture Chapter IV.—Grain washing, malting, brewing, and distilling Chapter V.—The leather trades. Chapter VI.—The paper trade. Chapter VII.—The textile trades. Chapter VIII.—The textile trades, continued Chapter IX.—The textile trades, continued. Chapter X.—Miscellaneous trades Chapter XI.—Pumps, screens, tanks, filters, and other apparatus. Chapter XII.—Discharge of trade waste water to public sewers. Chapter XIII.—Methods of analysis and limits of impurity. Index.

WILSON, JOHN ARTHUR. The Chemistry of Leather Manufacture. American Chemical Society Monograph. About 450 p. Ready about March, 1922.

WILSON, L. C. Corrosion of Iron; a summary of causes and preventive measures. 178 p. 12 mo. il. 1915. $2.00

CONTENTS: The rust problem; Theories of corrosion; Protective measures; Paint materials; Protective paints; Influence of different elements on corrosion of iron; Corrosion of wrought iron and steel pipe

WINTON, A. L., and Others. The Microscopy of Vegetable Foods. 717 p. 8 vo, il. 1916. $6.50

CONTENTS: Equipment, methods and general principles; Introduction, apparatus, reagents, collections, preparation of materials, principal histological elements; Grain: Its products and impurities, Flour, cattle foods, cereals, buckwheats; Weed seeds, Fungus impurities; Oil seeds and oil cakes, Legumes, Nuts, Fruit and fruit products; Vegetables, Alkaloidal products (tea, coffee, cocoa, tobacco, etc.), and their substitutes, Spices and condiments; Commercial starches.

WITHAM, G. S., Sr. Modern Pulp and Paper Making. 599 p. 8 vo. Over 240 illustrations. 1920. (Published by The Chemical Catalog Company, Inc.)

In U. S. and Canada	$6.00
In other countries	$6.50

This volume is the first treatise published giving in the most complete detail a description of the best American practice in the manufacture of paper. It is written by the manager of one of the largest corporations in the world engaged in the manufacture of paper and pulp. Each piece of equipment is described in detail. Minute instructions are given for operating every machine. There are more than 240 illustrations from actual photographs, with charts and diagrams. A complete practical treatise on the manufacture of pulp and paper from the saw-mill to the finishing room.

CONTENTS: Processes by which pulp is produced Materials of pulp. Varieties of paper. The Saw mill. The Wood room. The Sulphite mill The Acid plant The Soda process The Sulphate process. The Ground Wood mill Bleaching The Beater room The Machine room The Finishing room. General design of Pulp and Paper Plants. Testing of paper and paper materials Paper defects. Power plant. Personnel Tables. Index.

WOOD, FRANCIS. Sanitary Engineering. A practical manual of town drainage and sewage and refuse disposal. For sanitary authorities, engineers, inspectors, architects, contractors, and students. Second edition. 306 p 8 vo. il. 1914. $3.50

CONTENTS: Introductory. Hydraulics, etc. Formulæ for velocity of water in pipes, etc. Earth pressure and retaining walls. Power. House drainage. Land drainage. Sewers. Separate systems. Sewage pumping. Sewer ventilation. Drainage areas. Sewers, manholes, lampholes, etc. Trade refuse and river pollution. Sewage disposal. Bacterial analysis. Sludge disposal. Construction. Materials, and cleansing of sewers. Refuse disposal. Chimneys and foundations. Index.

WOOD, H. C., REMINGTON, JOSEPH P., and SADTLER, SAMUEL P., assisted by A. B. Lyons, and H. C. Wood, Jr. United States Dispensatory. Twentieth edition. 2012 p. 4 to. 1918. $12.00

Revised and largely rewritten, on the basis of the new United States Pharmacopœia and the last edition of the British Pharmacopœia. Includes the Pure Food and Drugs Act decisions.

WOOD, JOSEPH R. Tablet Manufacture. Its history, pharmacy, and practice. 224 p. 12 mo. il. 1904. $2.00

Contents: History—Compressed tablets. Moulded tablets. Introduction—General considerations. Triturating—Apparatus: Mortars and pestles, powder mixers, ball and pebble mills, chasers. Methods of triturating. Mixing, granulating, and drying—Apparatus: Mass mixers, spiral blade and spatula-blade grinding mill, sieves, drying-closets. List of substances requiring no granulation. Excipients and their applications. Moistening agents Adhesives. Bases Disintegrator. Absorbents. Treatment of various classes of medicaments:—Chemicals, drugs, pharmaceutical preparations, volatile substances, effervescent tablets. Lubricating-sticking Picking. Oil. Talcum. Boric acid. Compressing-tablet-machines: Setting up, care of Punches and dies: Care of, difficulties and remedies, choice of size. Regulation of weight. Variation in weight Causes and remedies. Regulation of pressure. Capping: Causes and remedies. Picking and sticking: Causes and remedies. Dust and siftings: Utilization. Coloring—Vegetable colors List of colors permitted. Forbidden methods of coloring. Construction of formulas—Systems of weight Triturate tablets. General formula. Illustrations of typical formulas. Compressed tablets proper. Illustrations of typical formulas. Lozenges. Treatment of individual substances Detailed methods of treatment of the principal medicaments used in compressed tablets. Formulary.

WOOD, R. A. The Waterbury Book of Alloys. By R. A. Wood, Loose-leaf. 244 p. 8 vo. 1915. $8.00

Contents. Brass rolling mill alloys; U. S. Government specifications for non-ferrous alloys; U. S. Government standard alloys, Aluminum bronze; Anodes; Scaling dips, Brass brazing solder, Dipping metal; Brazed brass tubing; Brazed tube notes, Common brass, Drawing brass; Extruded metal, Flux; Furnace linings; Impurities in brass intended for rolling, Jewellers' composition bars or platers metal, Lamp burners; Effect of mercury upon the copper alloys, Molds for casting pure nickel; Commercial nickel; Blow holes and spueys, Replating silver-plated articles; Sign brass sheet, Use of strainer when pouring metal into iron molds; Silvering paste, Temperature of metal as determined by the eye; Tempered copper; Manufacture of zinc, Chain bronze.

WOODHOUSE, T. Cordage and Cordage Hemp and Fibers. (Pitman's Common Commodities and Industries) 113 p il. 12 mo. 1920. $1.00

Contents: Introduction; Definition of cordage and sources of fibers; Classification of fibers, The cultivation of hemp; Retting, breaking and scutching, The cultivation of plants for hard fibers, The preparing and spinning machinery for hemp and other soft fibers, The preparing and spinning machinery for manila and other hard fibers; Twines, cords and lines; Ropes and rope making; Yarn numbering, Marketing

WOODHOUSE, T., and KILGOUR, P. The Jute Industry. (Pitman's Common Commodities and Industries.) 130 p il. 12 mo. 1921. $1.00

Contents: Introduction; Cultivation; Retting; Assorting and baling jute fiber, Mill operations; Batching; Carding; Drawing and drawing tables, The roving frame; Spinning; Twisting and reeling; Winding, Rolls and cops, Warping, beaming and dressing, Tying on, drawing in and weaving; Finishing.

WOODMAN, A. G. Food Analysis. 510 p. 8 vo. 1915. $3.50

Contents: I—General methods. II Microscopical examination of foods. III—Food colors and preservatives IV.—Milk and cream. V.—Edible fats and oils. VI—Carbohydrate foods VII—Cocoa and chocolate. VIII.—Spices. IX.—Cider vinegar. X—Flavoring extracts. XI.—Alcoholic foods.

WORDEN, EDWARD C. Nitrocellulose Industry. A compendium of the history, chemistry, manufacture, commercial application, and analysis of the nitrates, acetates, and xanthates of cellulose as applied to the peaceful arts, with a chapter on gum cotton, smokeless powder, and explosive nitrates. Two volumes. 324 p. 8 vo. 1911. $10.00

Contents: Cellulose The cellulose nitrates (theory) Nitration of cellulose (practice). Cellulose nitrate solvents and non-solvents Fusel oil, natural and synthetic. Amyl alcohols. Manufacture and properties of amyl acetate. Natural, artificial, synthetic camphor. Camphor substitutes. Paint removers. Turpentine substitutes Pyroxylin solutions. Pyroxylin lacquers. Bronzing liquids Water-proofing compositions. Artificial leather, fur, skin, feathers, rubber Pyroxylin-coated leather and splits. Patent and enameled leather Celluloid, pyralin, xylonite, viscoloid. Pyroxylin plastics. Celloidin and cellulose nitrates in microscopy. Collodion and celluloid nitrates in pharmacy, medicine. Film manufacture and photography Artificial silk, whalebone, gorse, horsehair. The cellulose acetates Gun-cotton and the explosive cellulose nitrates. Viscose, viscoid, and the cellulose xanthates. Denatured ethyl alcohol. Patent, author, and subject index.

The most complete and comprehensive work on the general technology of nitro-cellulose ever issued in any language, and adequately covers the entire field in detail. It contains over 8000 patent and literature references of over 2900 different investigators, representing the work of everyone in the field from the earliest days to the present.

WORDEN, E. C. Technology of Cellulose Esters. A theoretical and practical treatise on the origin, history, chemistry, manufacture, technical application and analysis of the products of acylation and alkylation of normal and modified celluose, including nitrocellulose, celluloid, pyroxylin, collodion, celloidin, gun-cotton, acetylcellulose and viscose, as applied to technology, pharmacy, microscopy, medicine, photography and the warlike and peaceful arts. In ten volumes. 600 il., 12 plates, containing upwards of 110,000 patent and literature references to the work of 12,000 different investigators. An exhaustive treatise. 4000 p. Vol. I., 5 parts. 1921. $40.00

Carbohydrate Carboxylates (Cellulose Acetate), being Vol. VIII. Illustrated. 1916. $5.00

WRAIGHT, E. A. Assaying in Theory and Practice. 383 p. 8 vo. 1914. $3.00

WREN, HENRY, The Organometallic Compounds of Zinc and Magnesium. 100 p. 12 mo. 1913. $1.00

Contents: General notes on Grignard's reaction; Products formed by the aid of Grignard's reagents; Theoretical; Zinc organometallic compounds; Bibliography.

WRIGHT, ARTHUR. Filtration. To be published by The Chemical Catalog Co., Inc. Ready about July 1, 1922.

WRIGHT, C. R. ADLER. Animal and Vegetable Fixed Oils, Fats, Butters, and Waxes. Edited and partly rewritten by C. Ainsworth Mitchell, B.A., F.I.C. Their preparation and properties, and the manufacture therefrom of candles, soaps, and other products. Third edition. 804 p. 8 vo. il. 1921. $16.50

Contents: Part I General composition and nature of oils, butters, fats, waxes, and allied substances. The sources and general nature of natural and artificial oils. Alcoholiform saponification products of oils, fats, waxes, etc.

Part II.—Physical properties of oils, fats, and waxes, etc.—General physical characters. Specific gravity and viscosity.

Part III Chemical properties of oils, fats, butters, and waxes—Proximate constituents and the methods used for their examination and determination. Chemical reactions of oils, fats, etc, and their uses as tests of purity, etc. Quantitative reactions of oils.

Part IV—Processes used for extracting, rendering, refining, and bleaching oils, fats, etc—Extraction of oils from seeds, etc, by pressure or solvents Animal fatty tissues Extraction of oils and fats therefrom. Refining and bleaching animal and vegetable oils, fats, waxes, etc. Recovery of grease from "suds," etc

Part V Classification and uses of fixed oils, fats, waxes, etc; Adulterations.—Classification Principal uses of oils and fats, etc. Adulteration of oils and fats

Part VI The candle industry—Materials used in candle making. Manufacture of candles, tapers, and night lamps.

Part VII—The soap industry Materials used in the manufacture of soap. Soap-making plant. Manufacture of soap General chemistry of soap—Soap analysis. Glycerol extraction—Manufacture of glycerine.

WRIGHT, F. B. Alcohol, its Manufacture from Farm Products, and Denaturing. Second edition, revised and enlarged. 271 p. il. 12 mo. $2.75

Contents Alcohol its various forms and sources. Mashing, cooling and fermentation in general Distillation, simple forms of stills, the production of alcohol from wine. Malting. Alcohol from potatoes, mashing, fermentation, distillations, continuous stills Alcohol from grain Alcohol from beets Alcohol from sorghum and molasses. Denatured alcohol and its commercial uses Alcoholometry. Tables.

WYER, S. S. Treatise on Producer Gas and Gas Producers. Second edition. 308 p. 8 vo. il. 1907. $4.00

Based on a series of articles in the *Engineering Magazine* The author is a well known consulting engineer specializing in producer gas and natural gas.

WYNNE, W. E., and SPRARAGEN, W. Handbook of Engineering Mathematics. Second edition, revised and enlarged. 290 p. 12 mo. il. 1916. Flexible "Fabrikoid." $2.50

Contents: Algebra, Geometry, Plane trigonometry; Spherical Trigonometry; Plane analytic geometry; Solid analytic geometry; Calculus; Hyperbolic functions, Differential equations, Theoretical mechanics; Hydraulics; Flow of fluids, Electricity; Measurement; Physical and chemical constants; Tables Endeavors to supply a handy means of reference to the theoretical and applied mathematics used in engineering, and while the first aim has been to make a mathematical handbook, the book is of greater value because it includes the underlying engineering data and applications as well as the mathematical formulæ It is intended primarily for students in engineering schools and colleges, and should serve practicing engineers as a convenient reminder of things which are easily forgotten but are needed in their work.

WYSOR, H. Analysis of Metallurgical and Engineering Materials. A systematic arrangement of laboratory methods. By Henry Wysor, B. S., Assistant Professor of Analytical Chemistry and Metallurgy in Lafayette College, Consulting Chemist and Metallurgist. 82 p. 4 to. il. 1912. $2.00

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YATES, R. F. How to Make and Use a Small Chemical Laboratory. 102 p 12 mo. 1920. $0.75

YENSEN, TRYGVE. Magnetic and Other Properties of Iron-silicon Alloys Melted in Vacuo. 67 p. 8 vo. 1915. $0.35

Bulletin 83 of the Engineering Experiment Station of the University of Illinois.

YOUNG, SYDNEY. Stoichiometry. Third edition. 277 p. 8 vo. il. 1919. $4.20

ZERR, GEORGE, and RUBENCAMP, DR. R. A Treatise on Color Manufacture. A guide to the preparation, examination, and application of all the pigment colors in practical use. Authorized English edition by Dr. Charles Mayer. 605 p. 8 vo. il. 1908. $11.50

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ZERR, GEORGE. Tests for Coal-tar Colors in Aniline Lakes. A review of the coal-tar coloring matters generally used in the lake industry, and their behavior with distinct chemical reagents. Authorized English translation by Dr. Charles Mayer. 230 p. 8 vo. 1910. **$6.00**

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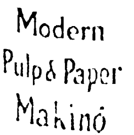

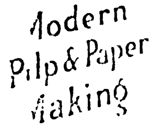

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